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PARTIAL ALTITUDE MILITARY QUALIFICATION TEST OF THE TF37-GE-1 TURBOFAN ENGINE

J. R. Evans and C. E. Chamblee

ARO, Inc.

February 1966

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FOREWORD

The test program reported herein was conducted at the request of the Aeronautical Systems Division (ASD), Air Force Systems Command (AFSC), for the Small Aircraft Engine Department of the General Electric Company under Program Element 62405214, Project 3066. The turbofan engine and operational liaison personnel were supplied by the Small Aircraft Engine Department of the General Electric Company.

The results of the test program presented were obtained by ARO, Inc. (a subsidiary of Sverdrup and Parcel, Inc.), contract operator of the Arnold Engineering Development Center (AEDC), AFSC, Arnold Air Force Station, Tennessee, under Contract AF40(600)-1200. The test was conducted in Propulsion Engine Test Cell (T-2) of the Rocket Test Facility (RTF) during the period from September 22 through October 4, 1965, under ARO Project No. RB0411, and the manuscript was submitted for publication on December 22, 1965.

This technical report has been reviewed and is approved.

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ABSTRACT

A partial altitude military qualification test of the TF37-GE-1 turbofan engine was conducted in accordance with the procedures outlined in MIL-E-5009B dated January 1958. Steady-state and/or transient data were obtained at flight conditions in the altitude range from sea level to 36,000 ft and in the Mach number range from 0 to 1.0 with standard, hot, and cold atmospheres. The steady-state engine performance in terms of net thrust and specific fuel consumption was equal to or better than the rated performance. Windmill starts and simulated flameouts and relights at altitudes up to 26,000 ft were successfully accomplished. The qualification test was terminated prior to completion because of compressor damage caused by foreign object ingestion.

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NOMENCLATURE

A	Area, in.^{2}
C_f	Flow coefficient
c_p	Specific heat at constant pressure, Btu/lb_m - °R

D_{LS}	Diameter of labyrinth seal, in.
EMP	Estimated minimum performance
F_{j_s}	Measured jet thrust, lb_f
F_{n_s}	Measured net thrust, lb_f
F_r	Free-stream momentum of inlet air, lb_f
F_s	Scale force, lb_f
f_e	Fuel-air ratio
g	Dimensional constant, 32.174 lb_m-ft/lb_f-sec^2
IBVP	Compressor interstage bleed valve position, percent
J	Mechanical equivalent of heat, 778.3 ft-lb_f/Btu
K_V	Velocity parameter
M	Mach number
m	Mass flow rate, slugs/sec
N	Rotor speed, rpm
P	Total pressure, psia
PLA	Power lever angle, deg
p	Static pressure, psia
R	Gas constant for air, 53.34 ft-lb_f/lb_m-°R
Re_I	Reynolds number index
RF	Thermocouple impact-recovery factor
SFC	Specific fuel consumption, lb_m-fuel/hr/lb_f net thrust
T	Total temperature, °R
V	Velocity, ft/sec, knots
W	Weight flow rate, lb_m/sec, lb_m/hr
γ	Ratio of specific heats
δ	Ratio of absolute total pressure to absolute pressure of ARDC model atmosphere at sea level (14.694 psia)
η	Efficiency
θ	Ratio of absolute total temperature to absolute temperature of ARDC model atmosphere at sea level (518.7°R)

ϕ	Ratio of absolute viscosity to absolute viscosity of ARDC model atmosphere at sea level

SUBSCRIPTS

0, 1, 1n 1z, 2, etc.	Instrumentation stations
00	Inlet plenum
a	Air
adj	Value adjusted to desired altitude ambient conditions
B	Burner
c	Compressor
des	Desired
e	Engine
eff	Effective
F	Fan
f	Fuel, force
g	Gas
i	Indicated
j	Jet
leak	Cell leakage
LS	Labyrinth-type seal
m	Mass
n	Net
OX	Aft end of test cell
z	Venturi exit
∞	Equivalent free-stream condition

SECTION I
INTRODUCTION

The TF37-GE-1 turbofan (Fig. 1) is an axial-flow, aft-fan, aircraft gas turbine engine. This turbofan engine uses the same gas generator as the J-85 turbojet engine. The aft-mounted fan which is aerodynamically, but not mechanically, connected to the engine rotor provides a 2:1 bypass ratio.

The principal objective of this test program was to accomplish an altitude military qualification test of the TF37-GE-1 engine per Military Specification MIL-E-5009B. This objective, however, was only partially attained because of compressor damage by foreign object ingestion. This report discusses engine steady-state and transient performance at simulated altitudes from sea level to 36,000 ft and simulated Mach numbers from 0.0 to 1.0. Engine windmill start data at simulated altitudes from 15,000 to 26,000 ft are presented. Test conditions at which performance data were obtained are listed in Appendix I.

All testing was conducted using TF37-GE-1 engine S/N 238005-4A as the test article.

SECTION II
APPARATUS

2.1 TEST ARTICLE

The TF37-GE-1 engine (Fig. 1) is an axial-flow, aft-fan, gas turbine engine. It incorporates an eight-stage, axial-flow compressor coupled directly to a two-stage reaction turbine; an annular combustion section; a free-floating, single-stage aft fan; a fixed-area, concentric exhaust section; and an integrated control system. The engine and fan inlet diameters are approximately 16.96 and 35.20 in., respectively; the overall engine length is 67.65 in., and the maximum dry weight is 675 lb. Rated sea-level static thrust is 4000 lb_f at military power and 4200 lb_f at maximum power.

The compressor has an overall total pressure ratio of 6.70 and a rated air flow of 43.1 lb_m/sec at the military rated rotor speed of 16,250 rpm during sea-level static operation (Ref. 1). Variable geometry, aileron-type inlet guide vanes are mechanically linked to the intercompressor bleed valves such that when the inlet guide vanes are

fully closed (31.5 deg from trail position), the bleed valves are positioned at 100-percent open area. The interstage bleed valves allow air to be extracted from the front stages of the compressor during low-speed operation to increase the stall margin. The bleed valves and inlet guide vanes are controlled by a cam and servomechanism in the main fuel control and are scheduled as a function of corrected engine rotor speed and compressor inlet temperature. Four ports are provided at the compressor discharge to permit high pressure air extraction for customer purposes.

The annular combustion chamber consists of a liner, an outer shell, and an inner shell. Fuel is introduced into the liner by twelve dual orifice nozzles.

A two-stage turbine drives the compressor. The turbine is cooled by compressor discharge air. Some of the cooling air passes across the front face of the first-stage turbine wheel, between the wheels and across the face of the second-stage wheel, and then enters the gas stream. The remainder cools the first-stage turbine nozzle and the first- and second-stage turbine blade shanks and then enters the gas stream.

The aft fan section (Fig. 1a) consists of a single-stage, free-floating rotor, which is part compressor and part turbine, and a front and rear frame incorporating concentric annular-flow passages. The fan rotor consists of a shaft, a rotor disk, and 54 blades. Each blade is made up of two airfoil sections separated by a dividing platform. The inner airfoil section is a turbine blade, and the outer section is a compressor blade.

Gases flowing aft from the gas generator turbine section flow into the inner passage of the fan front frame and through the fan turbine nozzles to the fan turbine. The gases impart energy to the blades to drive the fan rotor and then flow through the inner passage of the fan rear frame and into the exhaust section. Secondary air is ducted into the fan inlet duct, through the outer air passage of the fan front frame, to the fan compressor. The nominal fan compressor pressure ratio is 1.6 at the rated fan speed of 8610 rpm. The air then flows through a row of outlet guide vanes, which straighten the direction of flow, and through the outer passage of the fan rear frame to the exhaust section. Secondary airflow through the fan is nominally 2.0 times that of the primary airflow through the engine.

The exhaust system consists of the inner exhaust cone and a confluent exhaust nozzle. The exhaust nozzle is designed to discharge

the primary and secondary airflow so that maximum forward thrust is obtained.

The fuel control system regulates fuel flow as a function of compressor inlet temperature, compressor discharge static pressure, engine rotor speed, and power lever angle. The fuel control also regulates the position of the compressor inlet guide vanes and the interstage bleed valves. A detailed description of the TF37-GE-1 turbofan engine is given in Ref. 1.

2.2 INSTALLATION

The engine was mounted on a flexure pivot thrust stand and installed in Propulsion Engine Test Cell (T-2) (Fig. 2). The engine tailpipe extended into a zero-leakage, labyrinth-type air seal mounted on the test cell exhaust ejector which was mounted in the downstream bulkhead of the test cell. A flow measuring venturi was installed between the bulkhead of the secondary inlet plenum and the bulkhead of the test cell inlet plenum. The secondary inlet plenum contained two flow straightening grids, and bellmouths were mounted on the gas generator and fan inlets to ensure a smooth flow of air. A detailed description of Propulsion Engine Test Cell (T-2) is given in Ref. 2.

2.3 INSTRUMENTATION

Pressure and temperature measurements were made at the stations shown in Fig. 3. Diagrams showing the number and type of instrumentation at each station are shown in Fig. 4. Steady-state aerodynamic pressures were indicated on manometers and photographically recorded. Temperature measurements were made by recording the millivolt output of thermocouples on magnetic tape from an analog-to-digital converter and converting to degrees with a digital computer.

Scale-force was measured by a strain-gage-type load cell with an analog-to-digital converter and converted to pounds force with a digital computer. Fuel flows were measured by turbine-type flowmeters and indicated on digital electronic frequency counters. Compressor interstage bleed valve position (and thus inlet guide vane position) was determined by measuring the position of the valve gate. Engine and fan speeds were measured with reluctance pickups and indicated on a digital electronic frequency counter.

Table I presents instrument ranges, recording methods, and system accuracies for steady-state parameters.

A photographically recording, galvanometer-type oscillograph was used to document transient engine performance; the number of channels and parameters recorded, the method of calibration, and the type of sensor used are listed in Table II.

SECTION III
PROCEDURE

3.1 SIMULATED FLIGHT CONDITIONS

Conditioned air was supplied to the test cell at the total pressure and temperature required to obtain the desired inlet conditions. Simulated altitudes in the test cell exhaust ejector (Fig. 2) were based on the altitude in geopotential measure of the ARDC model atmosphere (Ref. 3) for standard atmosphere conditions and on MIL-STD-210A (Ref. 4) for hot and cold atmosphere conditions. One-dimensional, isentropic, compressible flow functions were used to determine the compressor inlet pressure and temperature for a desired Mach number. The Aerospace Industries Association (AIA) standard inlet recovery was assumed for all flight conditions. When inlet and altitude pressures deviated from the desired conditions, the affected calculated parameters were adjusted to the desired set conditions (Appendix II).

3.2 POWER SETTINGS

Gas generator rotor speed was trimmed to 16,500 rpm for maximum power at sea-level static, standard atmosphere conditions at the beginning of the investigation, and no adjustments were made thereafter. Military power was defined as 16,250-rpm gas generator rotor speed at sea-level static, standard atmosphere conditions. All steady-state performance conditions were set by approaching the desired power condition from the low side, thus eliminating any influence of control hysteresis between accelerating and decelerating power conditions.

3.3 ALTITUDE STARTS

Prior to each attempted start, compressor inlet pressure was set to provide the required engine rotor windmill speed at the desired altitude pressure. Compressor inlet temperature was set at a level consistent with the estimated Mach number required to provide the desired engine rotor windmill speed.

At each condition where successful altitude starts were obtained, a fuel starvation flameout and relight was attempted. This was accomplished by closing the fuel supply valve ahead of the engine, and, when flameout was indicated by a drop in turbine discharge temperature, simultaneously opening the fuel valve and energizing the ignition system.

3.4 AIR LEAKAGE CHECKS

Prior to the beginning of engine testing, test cell air leakage checks were performed with the test cell secondary plenum and the exhaust ejector sealed with blankoff plates. Test cell leakage was determined at test cell pressures from 2.0 to 26.0 psia and is presented in Fig. 5.

3.5 FUEL AND OIL

Fuel conforming to MIL-J-5624E, Grade JP-4, and oil conforming to MIL-L-7808D were used during this investigation. Fuel temperature was not controlled but was supplied at ambient temperature.

3.6 DATA AND CALCULATIONS

The methods used in calculating steady-state parameters are presented in Appendix II. The tabulated steady-state data are presented in Appendix I. The transient data are presented in Appendix III (limited distribution under separate cover).

SECTION IV
RESULTS AND DISCUSSION

The results of a partial altitude military qualification test of the TF37-GE-1 turbofan engine are discussed. The primary objectives of the qualification test were to demonstrate engine steady-state and transient performance at the altitude rating points and functional test points indicated in Fig. 6 and to demonstrate altitude windmill start capability at the conditions indicated in Fig. 7.

Steady-state and transient performance data are presented in Appendixes I and III, respectively. Steady-state performance is compared with the rated performance and/or the estimated minimum performance (EMP) obtained from Ref. 1. Engine transient performance and altitude windmill start results are discussed.

After steady-state and transient testing at altitudes from sea level to 36,000 ft and Mach numbers from 0.0 to 1.0 and windmill start series at altitudes from 15,000 to 26,000 ft had been accomplished, testing was terminated because of damage to the gas generator compressor (Fig. 8) by foreign object ingestion.

4.1 ENGINE PERFORMANCE COMPARISONS

4.1.1 Comparison of Engine Performance with Rated Values

The engine performance ratings are indicated in Ref. 1 where minimum thrust values are listed with maximum allowable values of specific fuel consumption (SFC), gas generator turbine discharge temperature (T_5), gas generator rotor speed (N_e), and fan rotor speed (N_F). At sea-level static, standard atmosphere conditions (Fig. 9a), SFC was lower than the rated value at each rated thrust value. At maximum rated thrust, SFC was 5.1 percent lower than the rated value and was 4.9 percent lower at military rated thrust. At 7500-ft altitude, Mach number 0.95, standard atmosphere conditions (Fig. 9b), SFC was 6.2 percent lower than the rated value at maximum rated thrust. At 36,089-ft altitude, Mach number 0.9, standard atmosphere conditions (Fig. 9c), SFC was equal to the rated value at military rated thrust. Rated thrust levels at all three flight conditions were obtained without exceeding the rated values of T_5, N_e, or N_F.

4.1.2 Comparison of Engine Performance with Estimated Minimum Performance

Estimated minimum performance (EMP) is listed for various flight conditions under Tabulated Data in Ref. 1. Specific fuel consumption was equal to or lower than the EMP at all flight conditions, and thrust levels where testing was accomplished. At military rated thrust, SFC was lower than the EMP value [from 4.9 percent at sea-level static, standard atmosphere (Fig. 9a) to 16.5 percent at 7500 ft, Mach number 1.0, hot atmosphere (Fig. 9d)]. At 36,089 ft, Mach number 0.9, standard atmosphere, SFC was equal to the estimated value at military rated thrust. The estimated values of N_e and N_F were not exceeded at 7500- or 36,089-ft altitude (Figs. 9b, c, d, and e) but were exceeded at sea-level static, standard atmosphere (Fig. 9a) below maximum rated thrust and at sea-level static, hot atmosphere (Fig. 9f) at both thrust levels. The estimated value of T_5 (Fig. 9) was exceeded at all flight conditions at thrust levels where a comparison was available.

4.2 ALTITUDE STARTS

At all the altitudes and gas generator rotor speeds where windmill starts were attempted (Fig. 7), starts were successfully accomplished. The flight conditions and gas generator rotor speed prior to each start are listed in Table III. After each series of three starts was accomplished, a fuel starvation flameout and relight were successfully performed.

4.3 TRANSIENT PERFORMANCE

Transient data were obtained at the flight condition indicated in Table IV and are presented in Appendix III. All the attempted accelerations and decelerations were successfully accomplished. A typical acceleration from idle to maximum power is presented in Fig. 10.

The engine specification (Ref. 1) requires that the time to accelerate the engine from idle to military power shall not exceed 5 sec and that the time to accelerate from idle to maximum power shall not exceed 10 sec (at a minimum of 150 knots indicated airspeed from 6000 ft to operational altitude in both cases.) All the attempted accelerations were successfully accomplished in less than 5 sec (Table IV).

4.4 COMPONENT PERFORMANCE

4.4.1 Compressor Performance

At a corrected gas generator rotor speed of 16,500 rpm (Fig. 11a), corrected compressor airflow was 43.7 lb_m/sec and at 12,250 rpm was 28.3 lb_m/sec. No effect of Mach number on the corrected rotor speed-corrected airflow relationship is apparent in the 14,500- to 16,000-rpm corrected speed range.

Compressor pressure ratio (Fig. 11b) varied from 6.94 at a corrected compressor airflow of 43.7 lb_m/sec to 3.25 at an airflow of 28.3 lb_m/sec. There is no apparent Mach number effect on this relationship where comparable data are available.

Compressor efficiency (Fig. 11c) was 80.0 percent at 16,500-rpm corrected rotor speed and increased to 83.3 percent at 14,500-rpm corrected rotor speed. No data are shown at corrected rotor speeds lower than 14,950 rpm where the interstage bleed valves were open (Fig. 12).

4.4.2 Fan Performance

Corrected fan airflow (Fig. 13a) varied from 83.0 lb_m/sec at 8500-rpm corrected fan rotor speed to 44.3 lb_m/sec at 4900-rpm corrected fan rotor speed at Mach number 0.0. At Mach numbers from 0.95 to 1.00, corrected fan airflow increased over the Mach number 0.0 values from 10.4 percent (8.3 lb_m/sec) at 8150 rpm to 18.4 percent (12.5 lb_m/sec) at 6950 rpm.

Fan bypass ratio (Fig. 13b) at Mach number 0.0 varied from 1.55 at a corrected fan rotor speed of 4900 rpm to 1.88 at 7600 rpm and remained constant at higher corrected speeds. At Mach numbers from 0.95 to 1.00, fan bypass ratio decreased from 2.49 at 6950-rpm to 2.08 at 8150-rpm corrected fan rotor speed.

Fan pressure ratio (Fig. 13c) varied from 1.13 at 44.3-lb_m/sec corrected fan airflow to 1.51 at 83.0 lb_m/sec at Mach number 0.0. At Mach numbers from 0.95 to 1.00, fan pressure ratio decreased by 18.9 percent at a corrected fan airflow of 83.0 lb_m/sec from the Mach number 0.0 value.

4.5 CYCLE PERFORMANCE

Corrected gas generator turbine discharge temperature (Fig. 14a) at an engine pressure ratio of 1.15 was 1380°R at Mach numbers 0.0, 0.95, and 1.00. At greater pressure ratios, corrected temperature was as much as 30°R higher at Mach numbers from 0.95 to 1.00 than at Mach number 0.0. At Mach numbers from 0.95 to 1.00, corrected fuel flow (Fig. 14b) increased over the Mach number 0.0 values by 350 lb_m/hr (31.8 percent) at a pressure ratio of 1.15 to 150 lb_m/hr (6.6 percent) at a pressure ratio of 1.39.

4.6 OPERATING INCIDENTS

During the final test period several engine flameouts occurred during slow accelerations from flight idle. At approximately 45,000 ft altitude, Mach number 1.0, flameout occurred at about 15,800 rpm gas generator rotor speed, and at approximately 36,000 ft altitude, Mach number 0.7, flameouts occurred at about 14,800 rpm and 15,400 rpm. Subsequent investigation revealed significant compressor damage (Fig. 8), which probably was a major contribution to the engine flameouts.

SECTION V
SUMMARY OF RESULTS

The results of a partial altitude military qualification test of the TF37-GE-1 turbofan engine are summarized as follows:

1. Specific fuel consumption was better (lower) than the manufacturer's maximum and military rated values (Ref. 1) by about 5.0 percent at maximum and military rated thrust at sea-level static, standard atmosphere conditions. At maximum rated thrust at 7500-ft altitude, Mach number 0.95, standard atmosphere conditions, specific fuel consumption was 6.2 percent lower than the rated value. At 36,089 ft, Mach number 0.9, standard atmosphere conditions, specific fuel consumption was equal to the rated value. Maximum and military rated thrust levels were attained without exceeding the rated values of gas generator exhaust temperature, gas generator rotor speed, or fan rotor speed.

2. The manufacturer's rated values and estimated minimum performance values (Ref. 1) differ except for the sea-level static, standard day value of specific fuel consumption at each rated thrust level and the value of gas generator rotor speed at maximum rated thrust and for the 36,089-ft, Mach number 0.9, standard day value of specific fuel consumption at military rated thrust. At military thrust, specific fuel consumption was lower than the estimated minimum performance value by 4.9 percent at sea-level static, standard atmosphere conditions, was lower than the estimated minimum performance value by 16.5 percent at 7500 ft, Mach number 1.0, hot atmosphere conditions, and was equal to the estimated value at 36,089 ft, Mach number 0.9, standard atmosphere. The estimated performance values of gas generator exhaust temperature were exceeded at all thrust levels where a comparison was possible at altitudes from sea level to 36,089 ft and Mach numbers from 0.0 to 1.0. At sea-level static conditions, the estimated performance values of gas generator rotor speed were exceeded at all thrust levels except maximum thrust, but were not exceeded at 7500 ft, Mach numbers from 0.95 to 1.00 or at 36,089 ft, Mach number 0.9 at any thrust level where a comparison was possible.

3. Air start series and simulated flameouts and relights at altitudes from 15,000 to 26,000 ft and at gas generator rotor speeds from 12.12 to 30.30 percent of maximum rated speed were successfully accomplished.

Mach numbers from 0.95 to 1.00, bypass ratio decreased from 2.49 at 6850-rpm to 2.08 at 8150-rpm corrected fan rotor speed.

4. Accelerations and decelerations were attempted at sea-level static and 7500-ft altitude, Mach number 1.0 conditions. All accelerations and decelerations were successfully accomplished, and all accelerations were accomplished in less than 5.0 sec.

5. At a corrected gas generator rotor speed of 16,500 rpm, the corrected compressor airflow was 43.7 lb_m/sec, and the compressor pressure ratio was 6.94. No effect of Mach number on compressor performance was apparent where comparable data were available. Fan bypass ratio was 1.88 at fan corrected rotor speeds of 7600 rpm and above at Mach number 0.0. At

REFERENCES

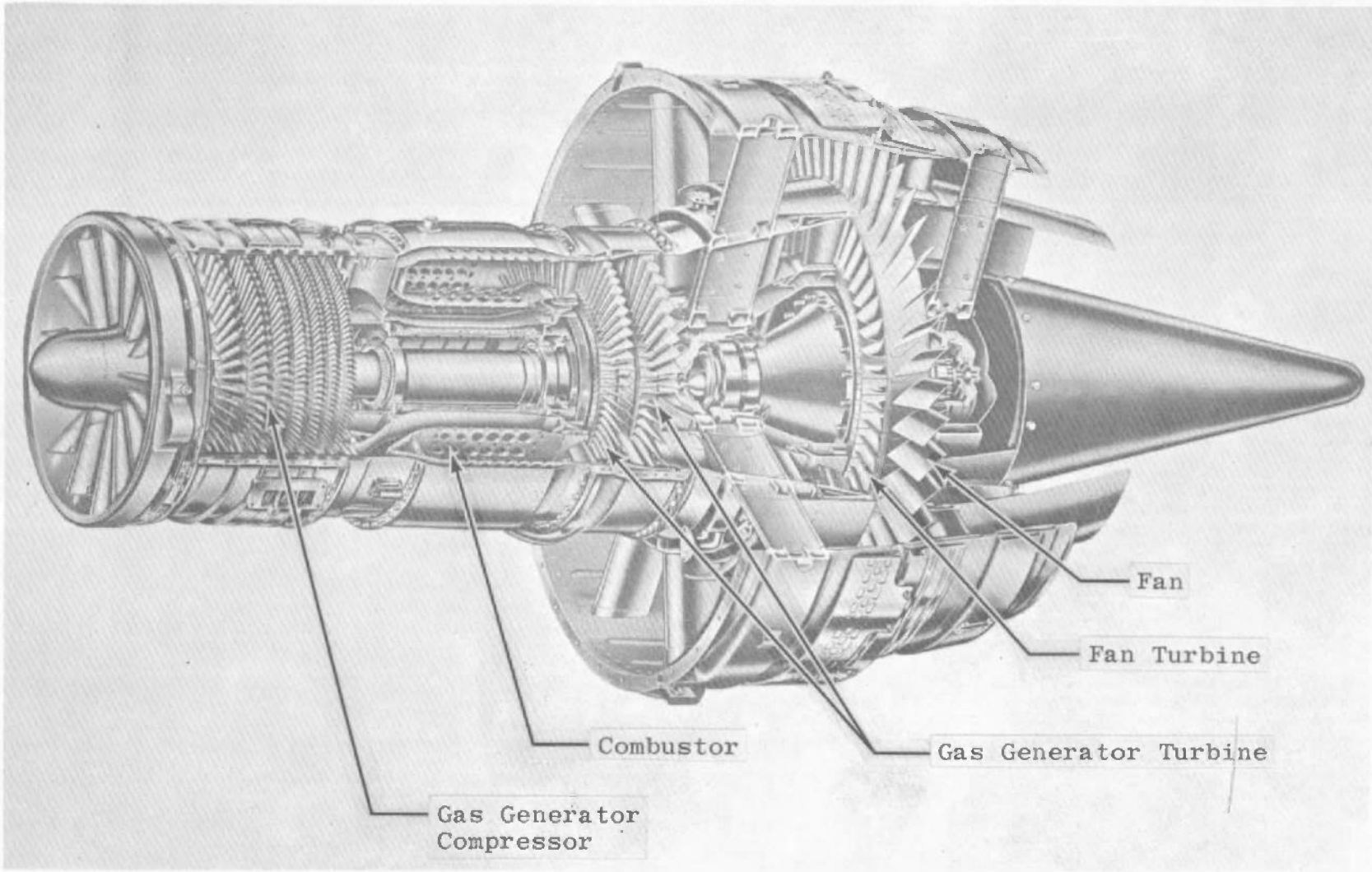
1. General Electric Company. "Model Specification E1067-Engine, Aircraft, Turbofan: TF37-GE-1." March 25, 1964.

2. Test Facilities Handbook (5th Edition). "Rocket Test Facility, Vol. 2." Arnold Engineering Development Center, July 1963.

3. Minzer, R. A., Champion, K. S. W., and Pond, H. L. "The ARDC Model Atmosphere, 1959." Geophysics Research Directorate, Air Force Cambridge Research Center, AFCRC-TR-59-267, August 1959.

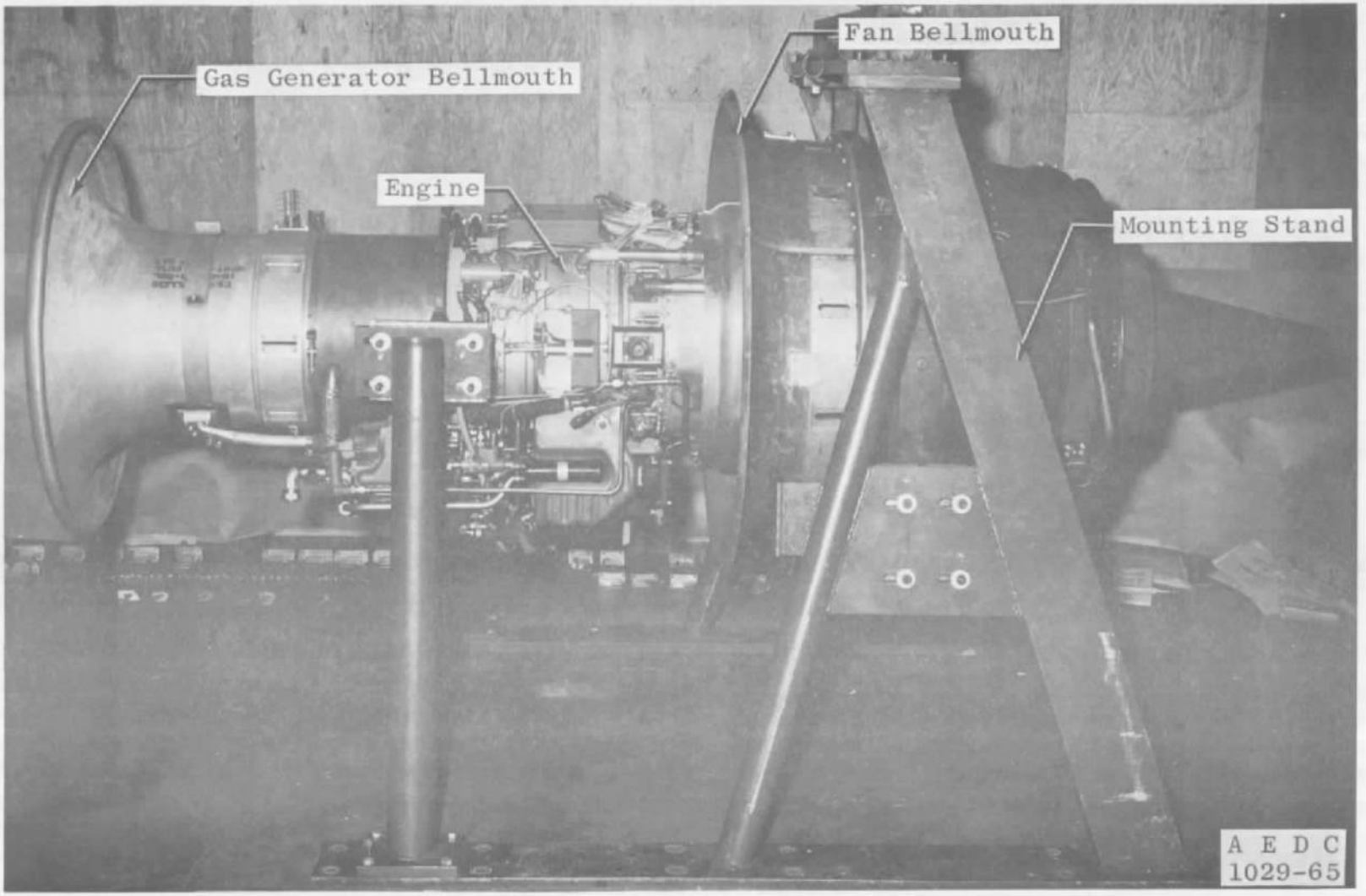
4. Military Standard. "Climatic Extremes for Military Equipment." MIL-STD-210A, August 2, 1957.

5. Wolff, H. E. "A Correlation of Venturi and Bellmouth Airflow Measurements for the J85-GE-5 Turbojet Engine Test Installation." AEDC-TDR-62-112 (AD276809), June 1962.



a. Cutaway

Fig. 1 General Electric TF37-GE-1 Turbofan Engine (Exhaust Nozzle Removed)



b. Photograph

Fig. 1 Concluded

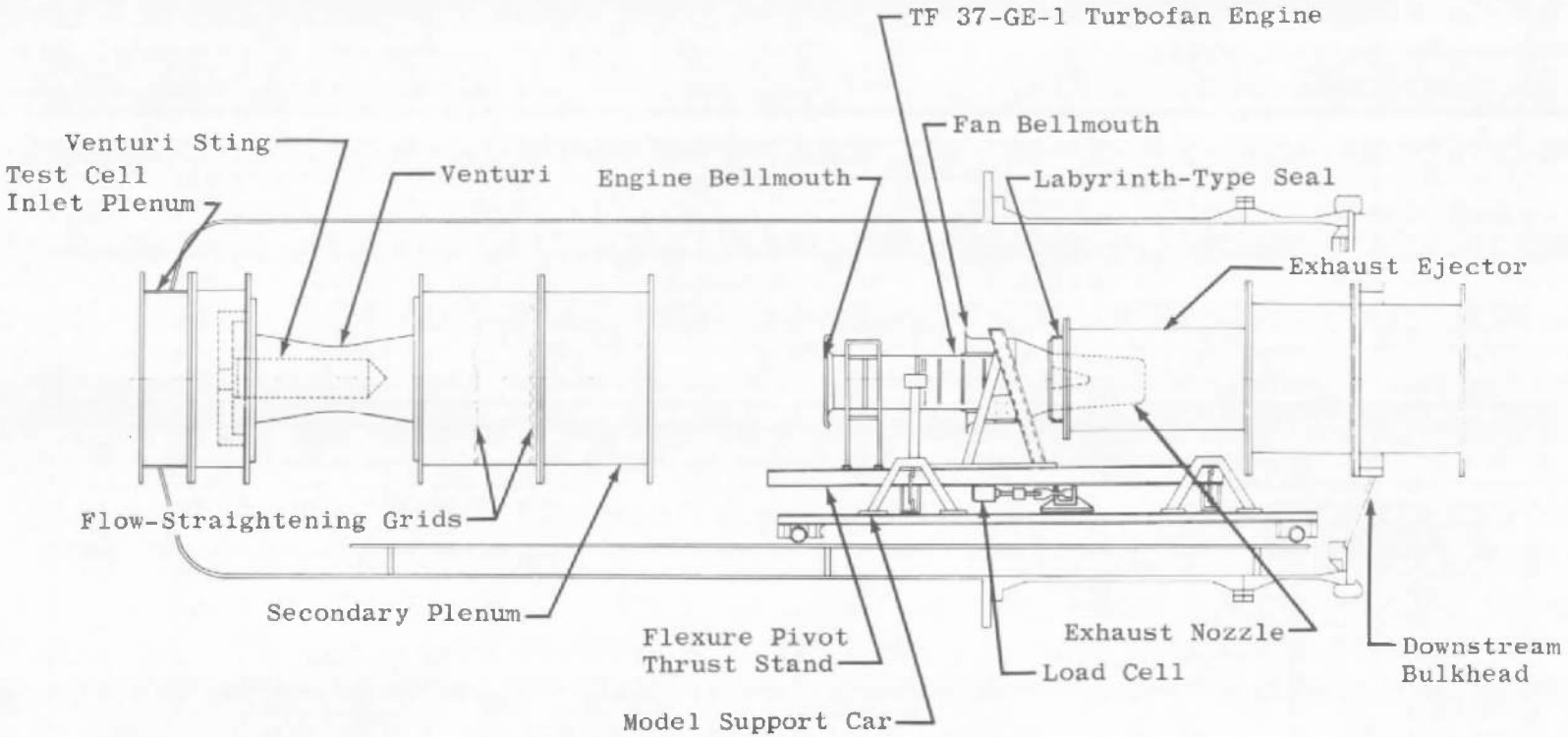
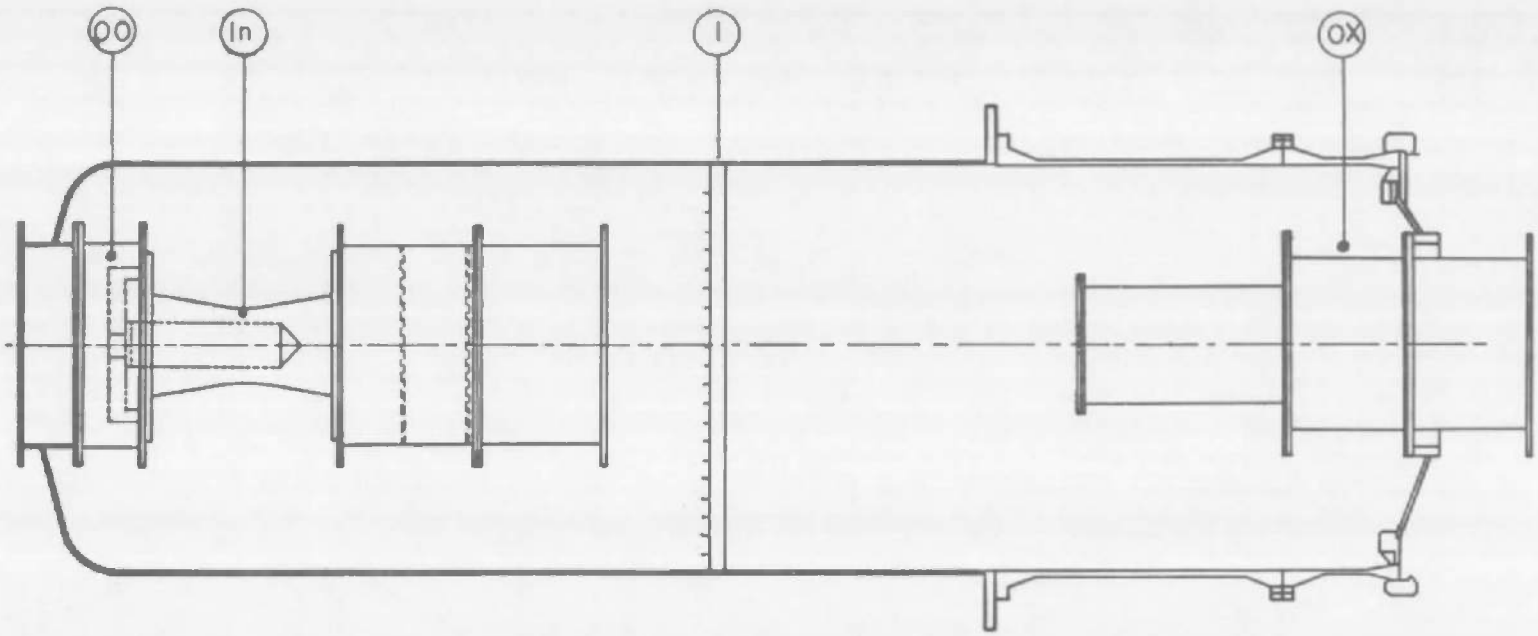


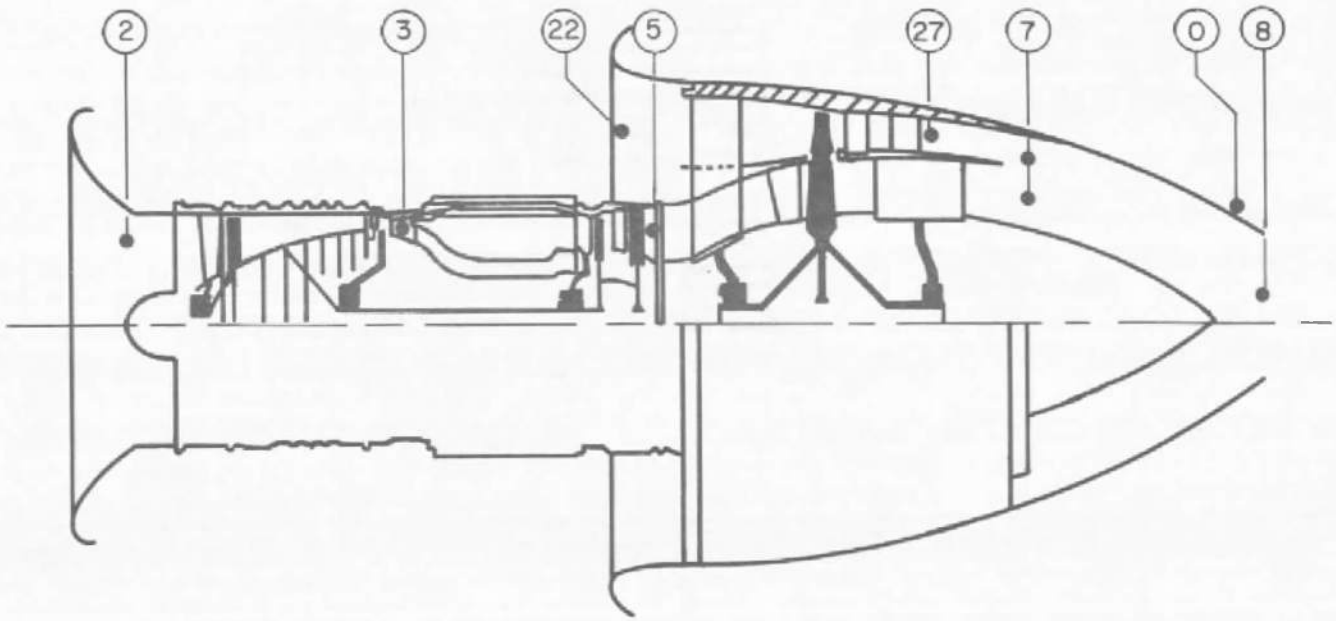
Fig. 2 Test Article Installed in Propulsion Engine Test Cell (T-2)



Station	00	1n	1	0X
Total Pressure	0	0	18	0
Static Pressure	2	4	6	8
Temperature	0	0	11	0

a. Test Cell Stations

Fig. 3 Instrumentation Station Locations

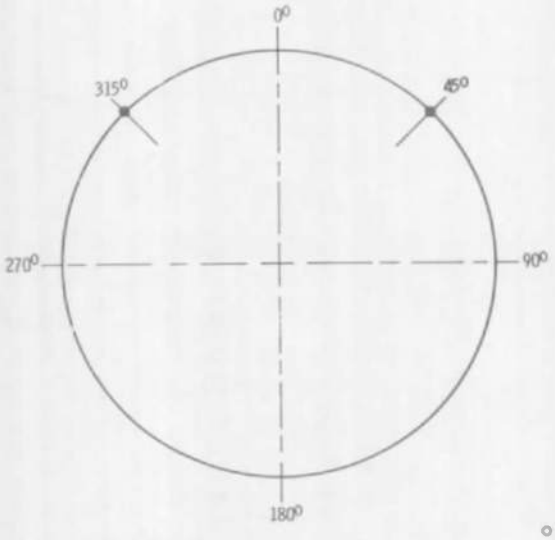


INSTRUMENTATION

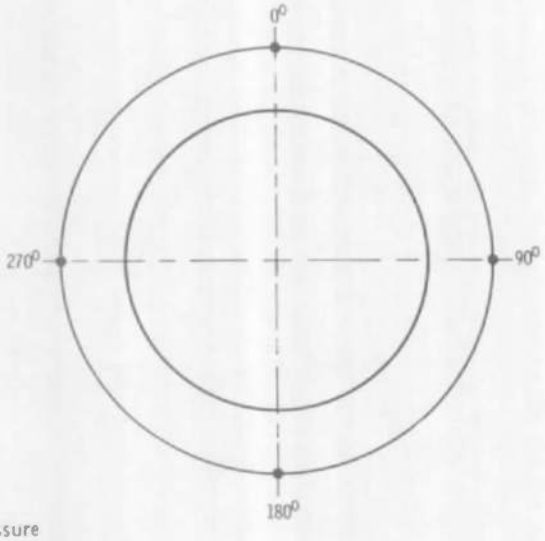
STATION	2	3	22	5	27	7	0	8
TOTAL PRESSURE	16	12	32	0	21	24	0	36
STATIC PRESSURE	16	0	32	0	3	0	4	0
THERMOCOUPLE	16	12	0	11	36	0	0	0

b. Engine Stations

Fig. 3 Concluded

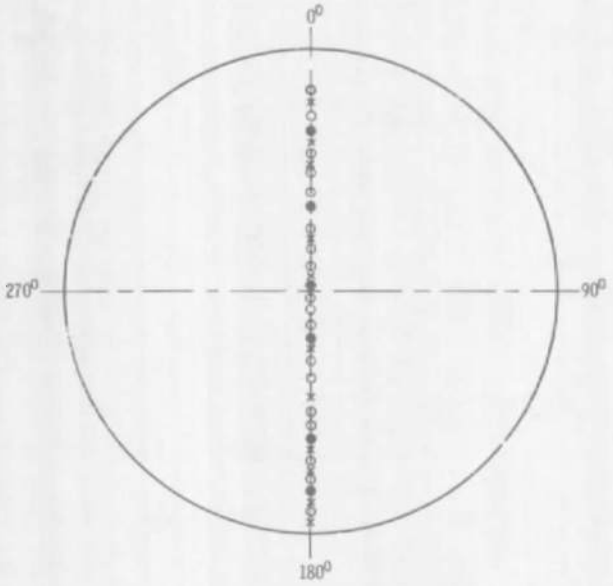


a. Stotian 00, Plenum Chomber Stotic Pressure, 7 in. Upstream af Venturi Inlet

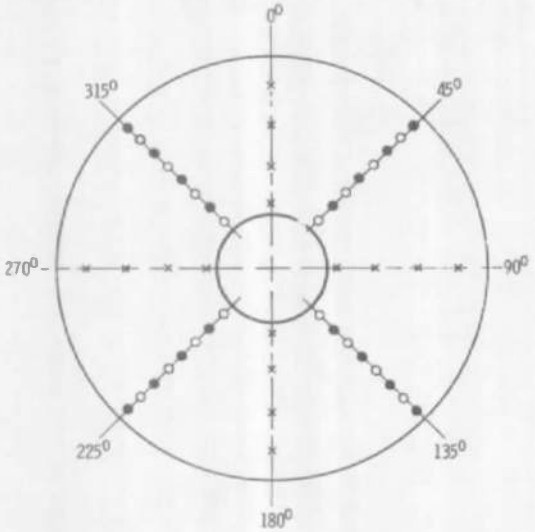


o Total Pressure
● Static Pressure
× Thermocouple

b. Stotion 1n, Venturi Throat, 14 in. Downstream af Venturi Inlet

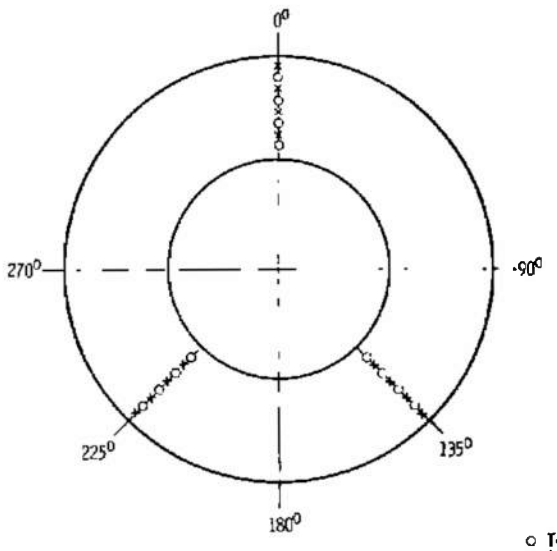


c. Stotion 1, Test Cell, 3.5 ft Upstream af Engine Bellmouth

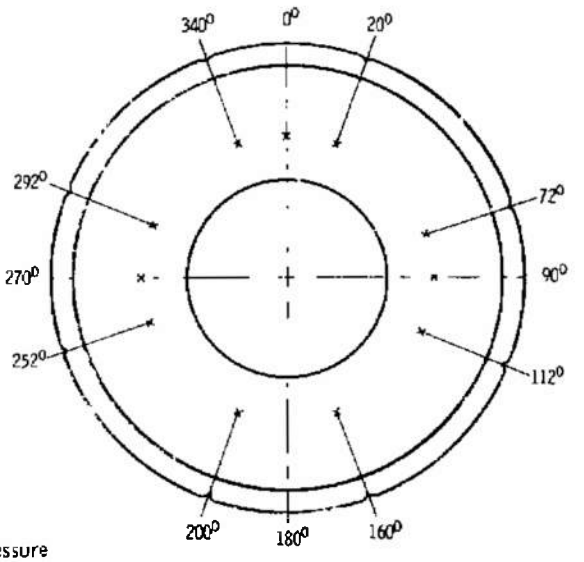


d. Stotian 2, Compressor Inlet, 3.25 in. Upstream of Inlet Guide Vane Leoding Edge

Fig. 4 Instrumentotion Stotion Detoils (looking upstream)

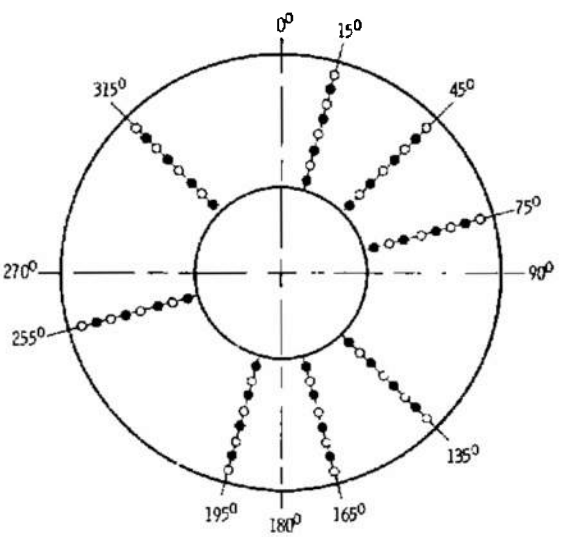


e. Station 3, Compressor Discharge, 0.5 in. Downstream of Compressor Exit Guide Vane Trailing Edge

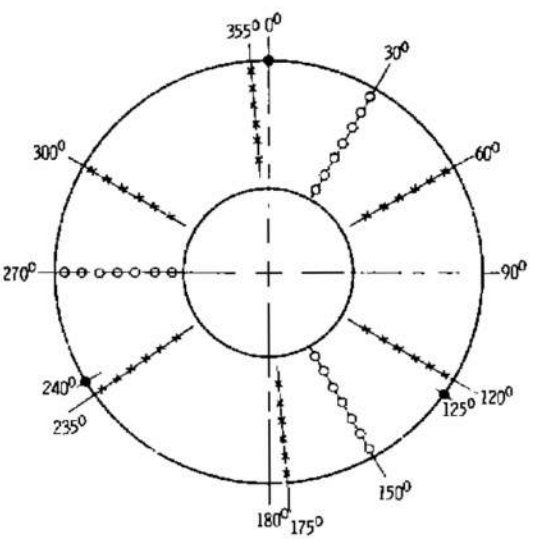


o Total Pressure
● Static Pressure
× Thermocouple

f. Station 5, Gas Generator Turbine Discharge, 4.7 in. Downstream of Second-Stage Turbine Blade Trailing Edge

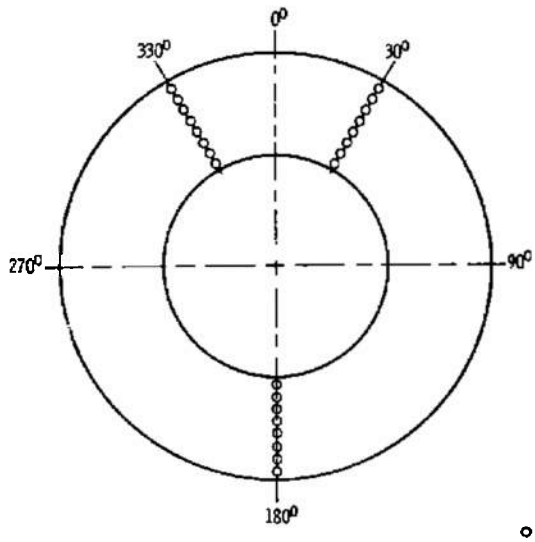


g. Station 22, Fan Inlet, 3.25 in. Upstream of Fan Front Frame Strut Leading Edge



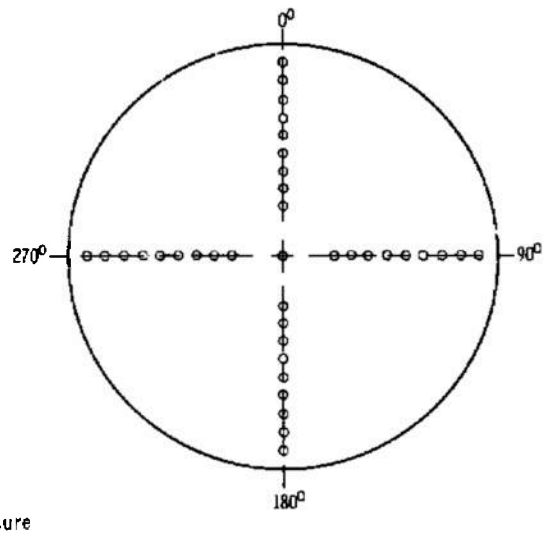
h. Station 27, Fan Discharge, 0.5 in. Downstream of Fan Exit Guide Vane Trailing Edge

Fig. 4 Continued

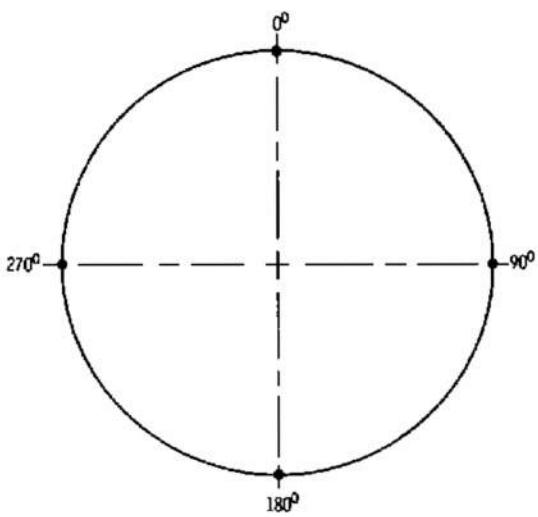


i. Station 7, Confluent Tailpipe, 17.4 in. Downstream of Fan Aft Frame Support Strut Trailing Edge

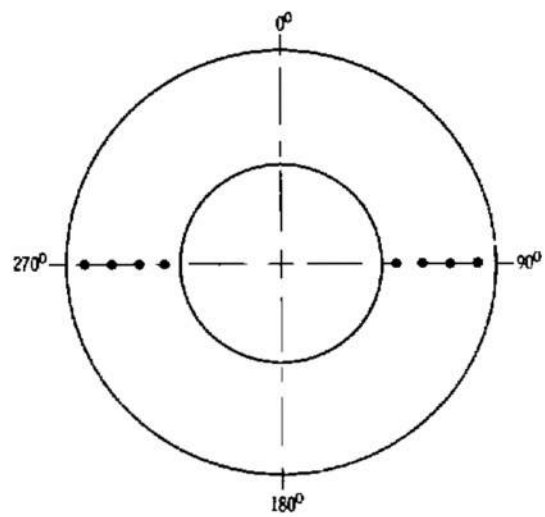
o Total Pressure
● Static Pressure
× Thermocouple



j. Station 8, Jet Nozzle Discharge, 1.0 in. Downstream of Plane of Jet Nozzle Exit



k. Station 0, Altitude Ambient, Outer Surface of Jet Nozzle at Exit Plane



l. Station 0X, Aft Test Cell, 1.0 ft from Downstream End of Test Cell

Fig. 4 Concluded

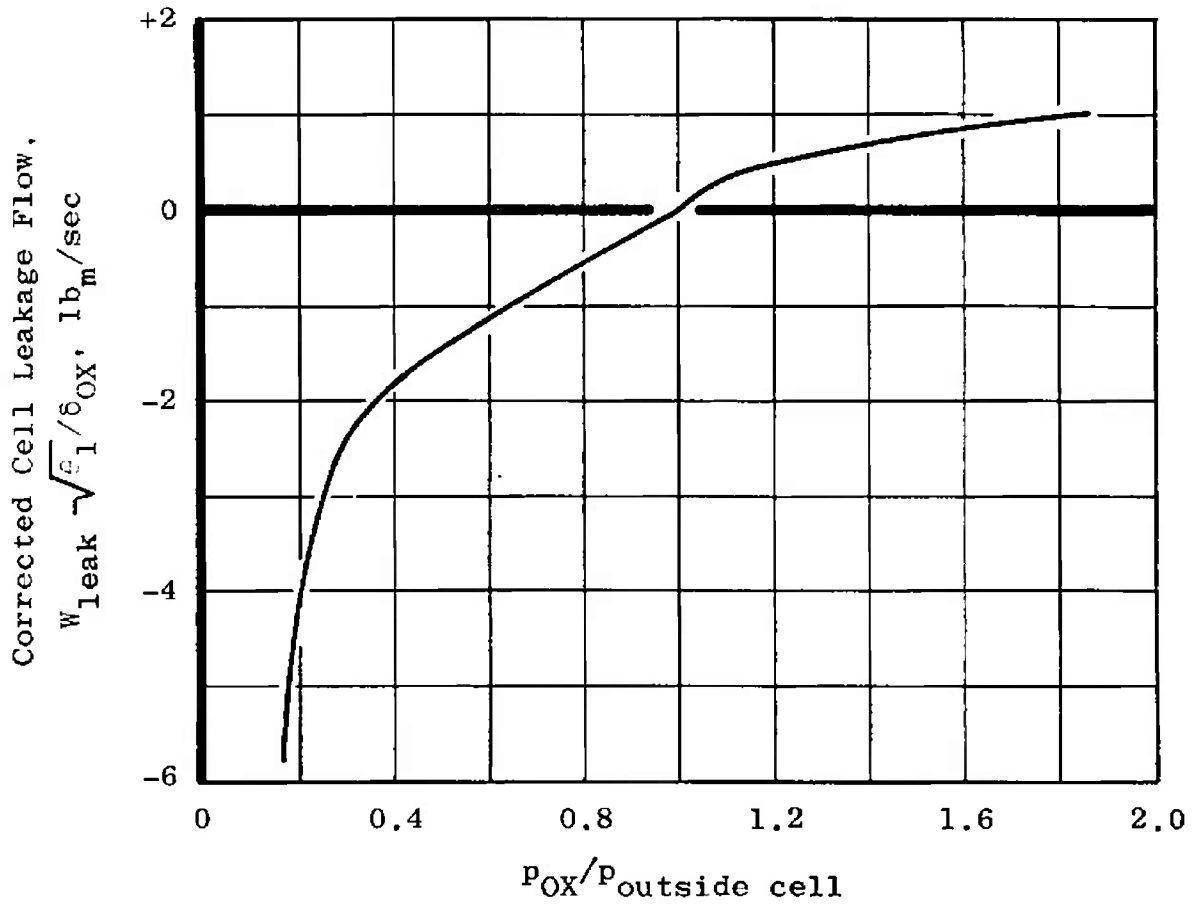


Fig. 5 Propulsion Engine Test Cell (T-2) Air Leakage

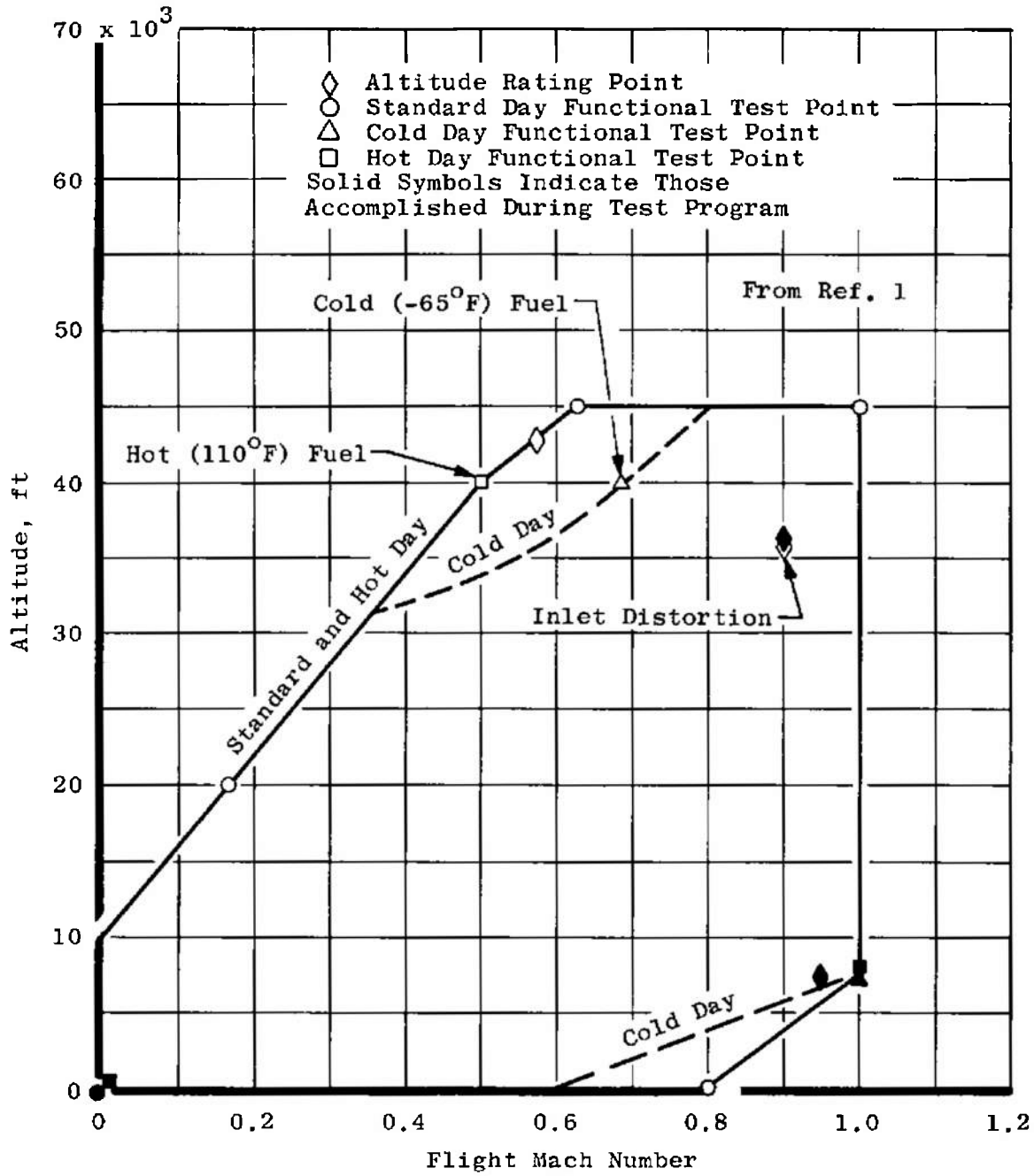


Fig. 6 TF-37-GE-1 Specified Altitude Test Points and Flight Envelope

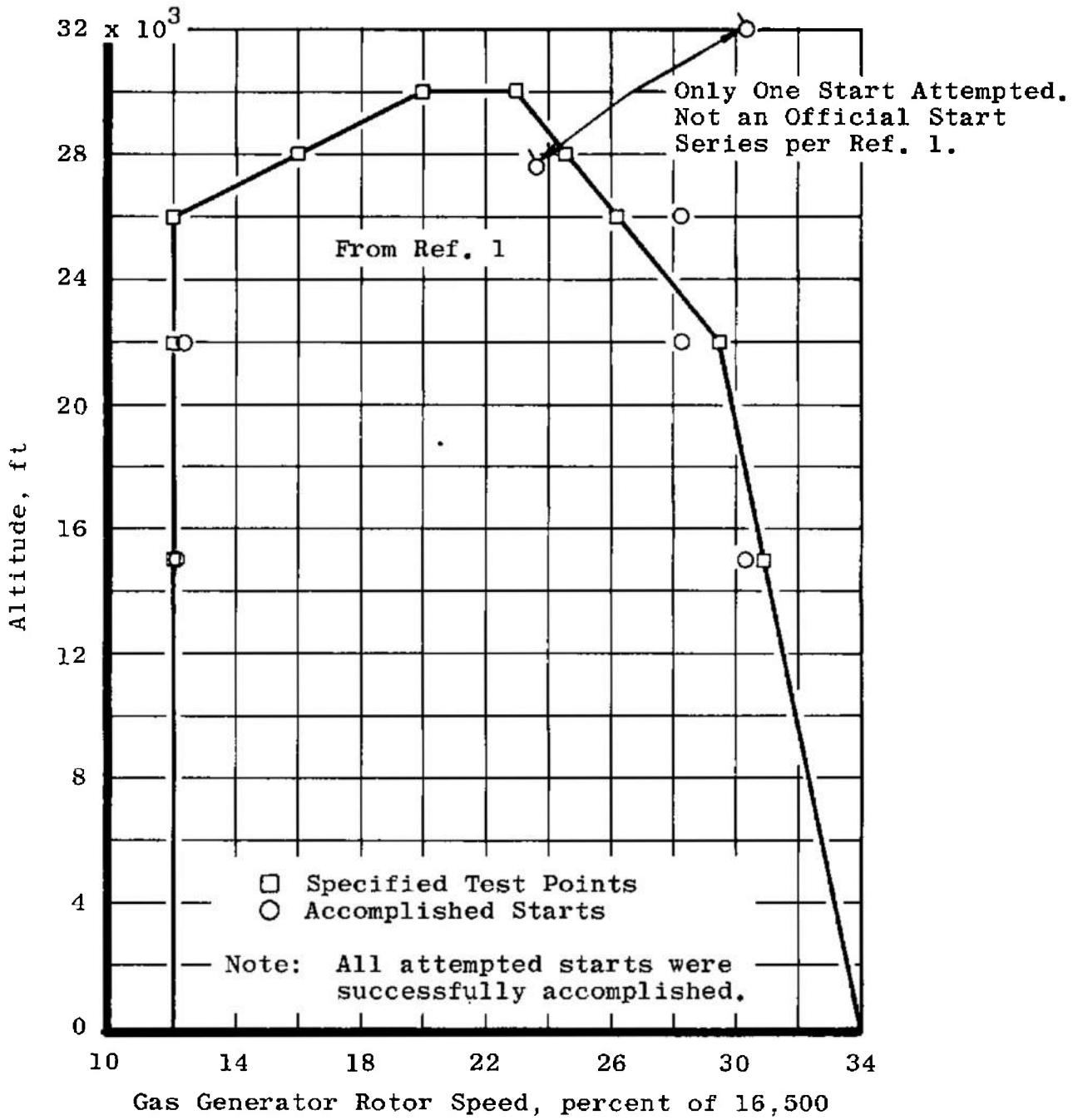
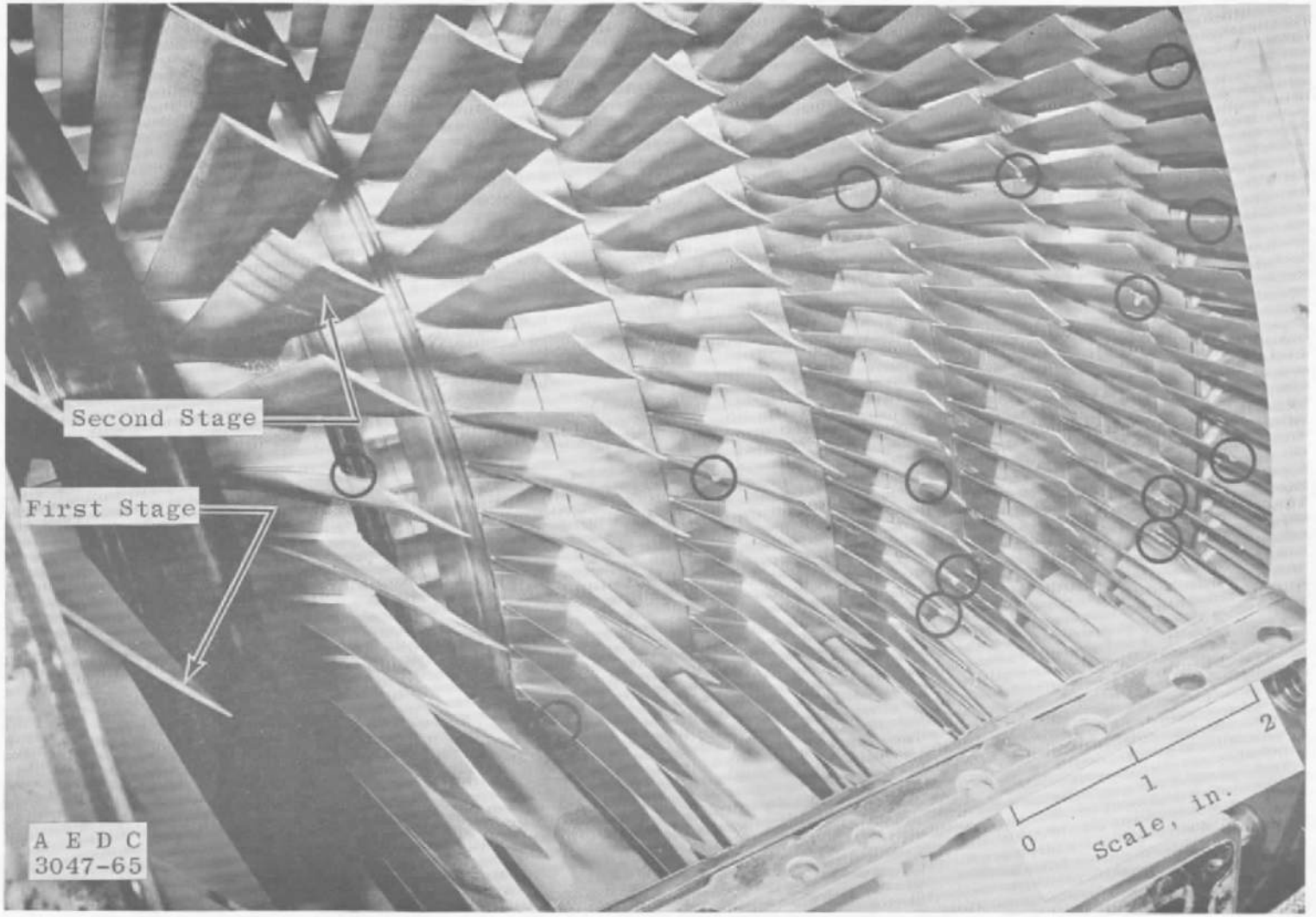
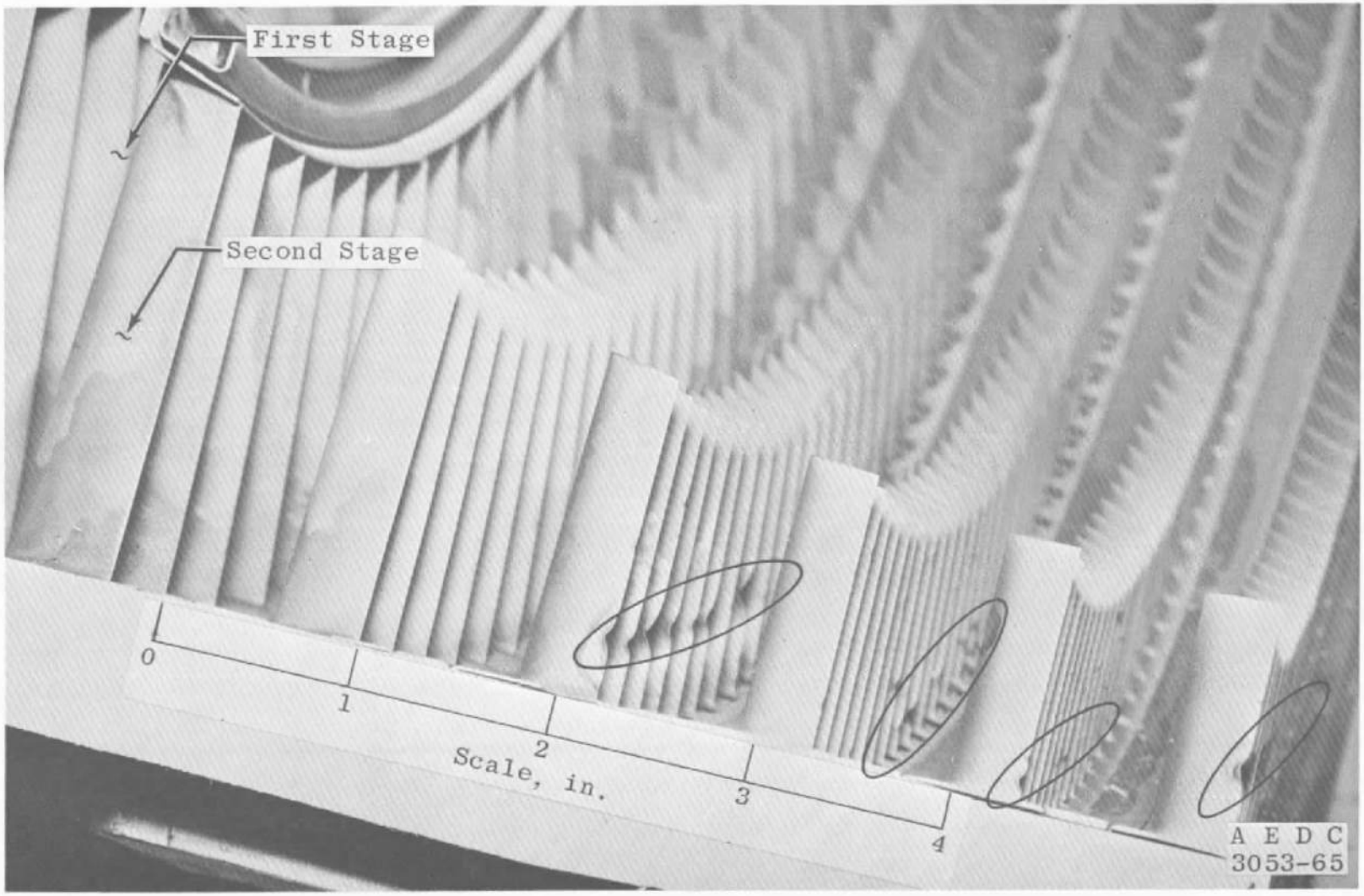


Fig. 7 TF37-GE-1 Windmill Start Envelope



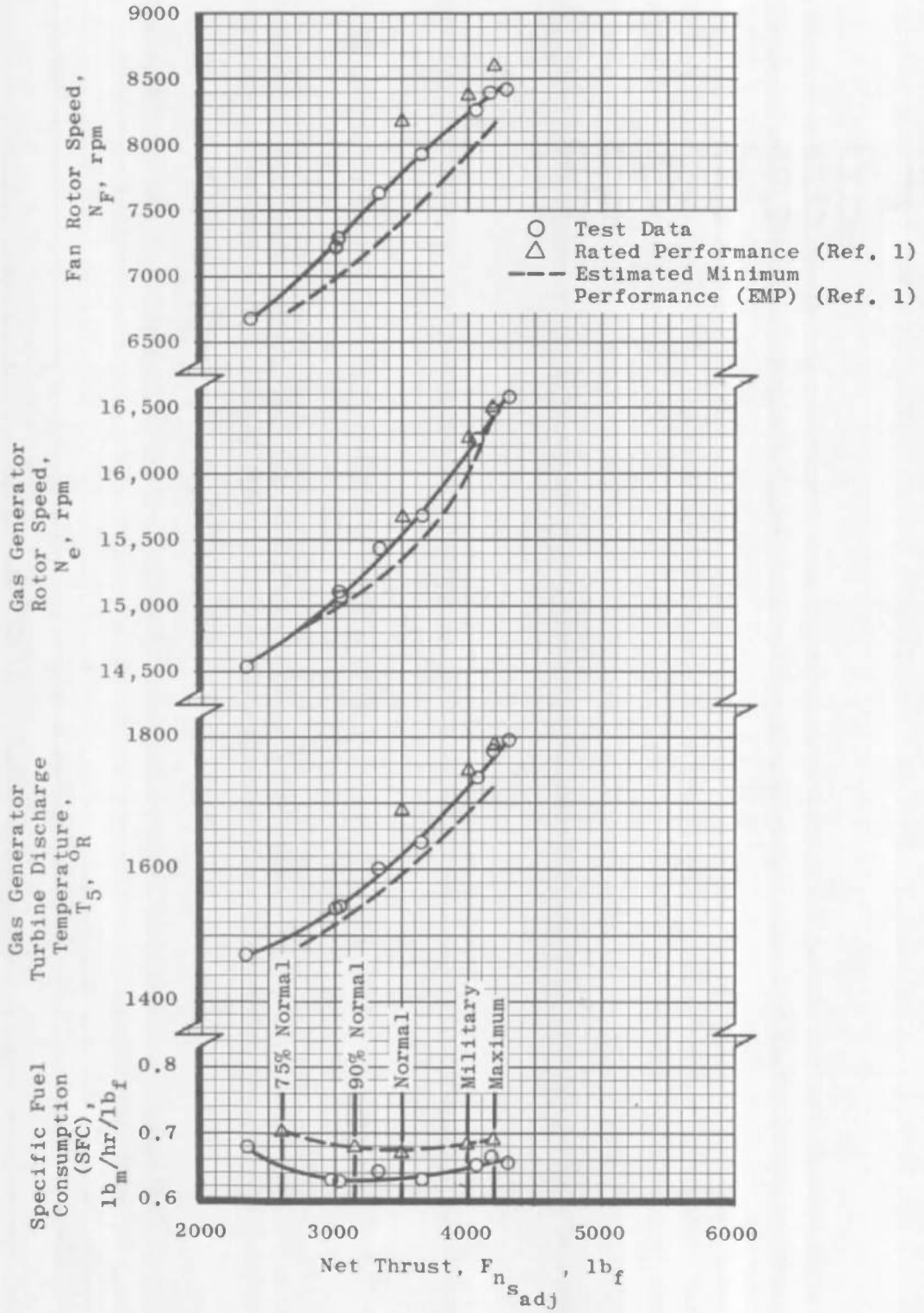
a. Rotor Blade Damage

Fig. 8 Photograph of Compressor Damage



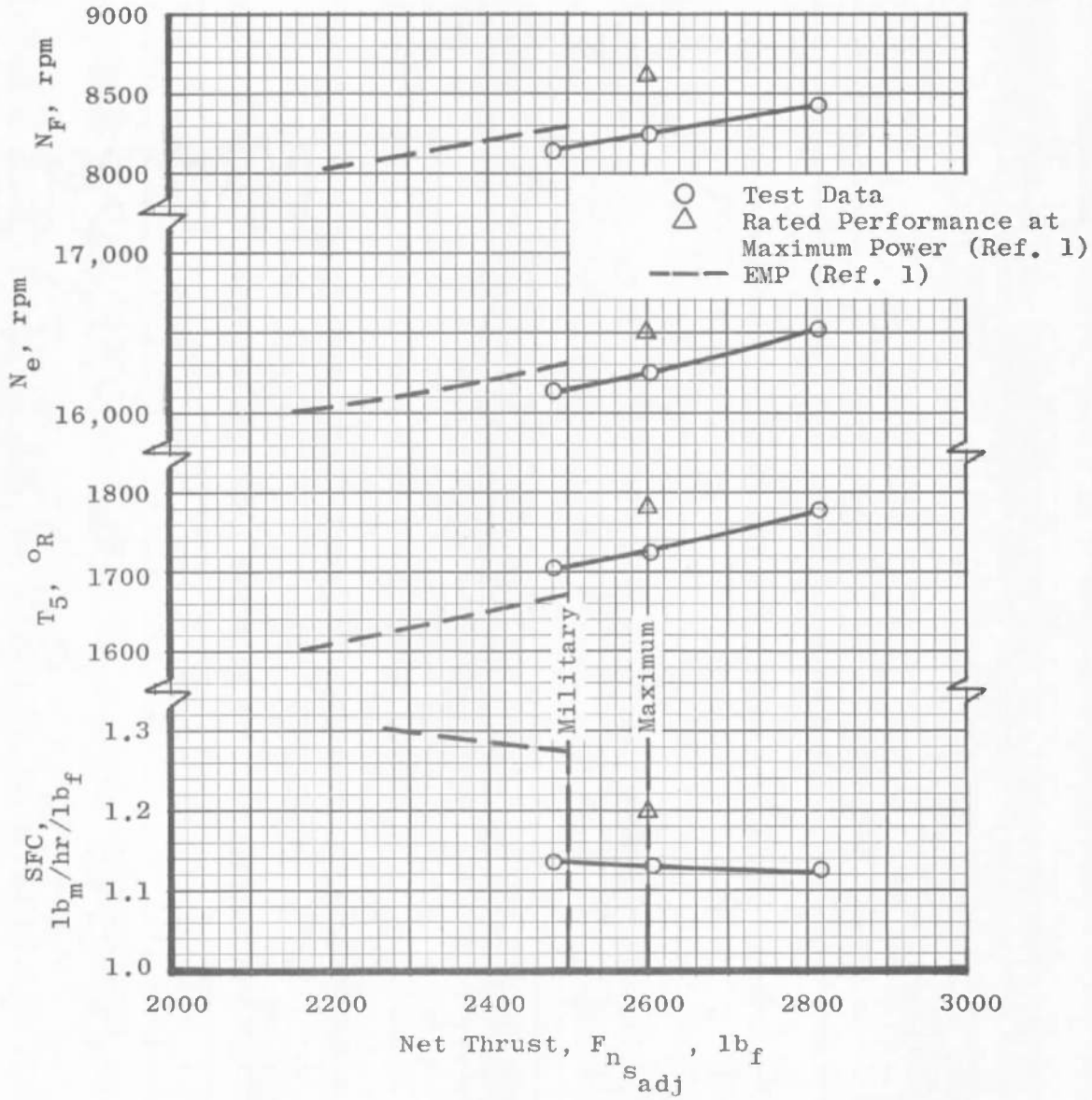
b. Stator Vane Damage

Fig. 8 Concluded



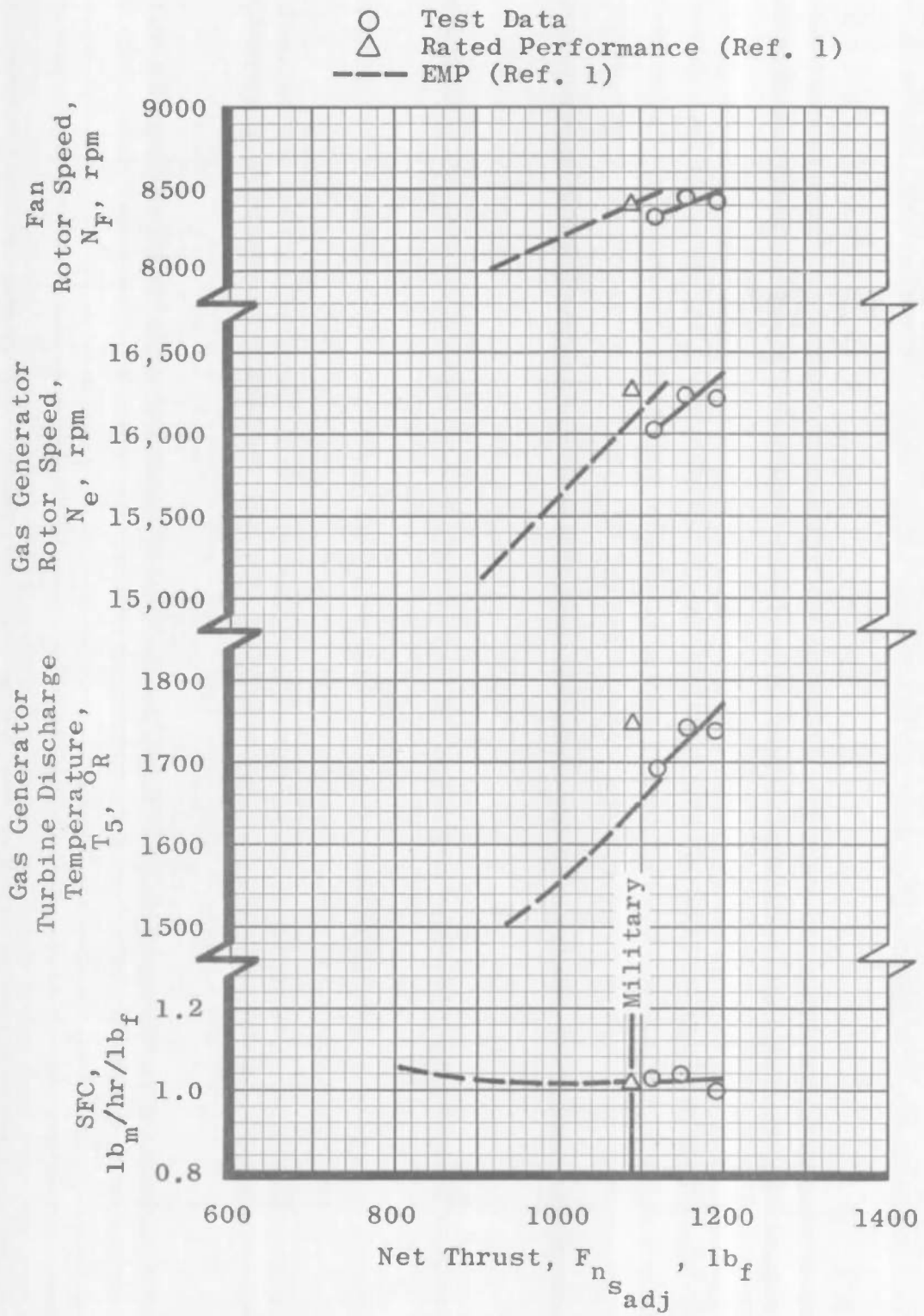
a. Sea-Level Static, Standard Atmosphere Performance

Fig. 9 Comparison of TF37-GE-1 Performance with Specified Performance



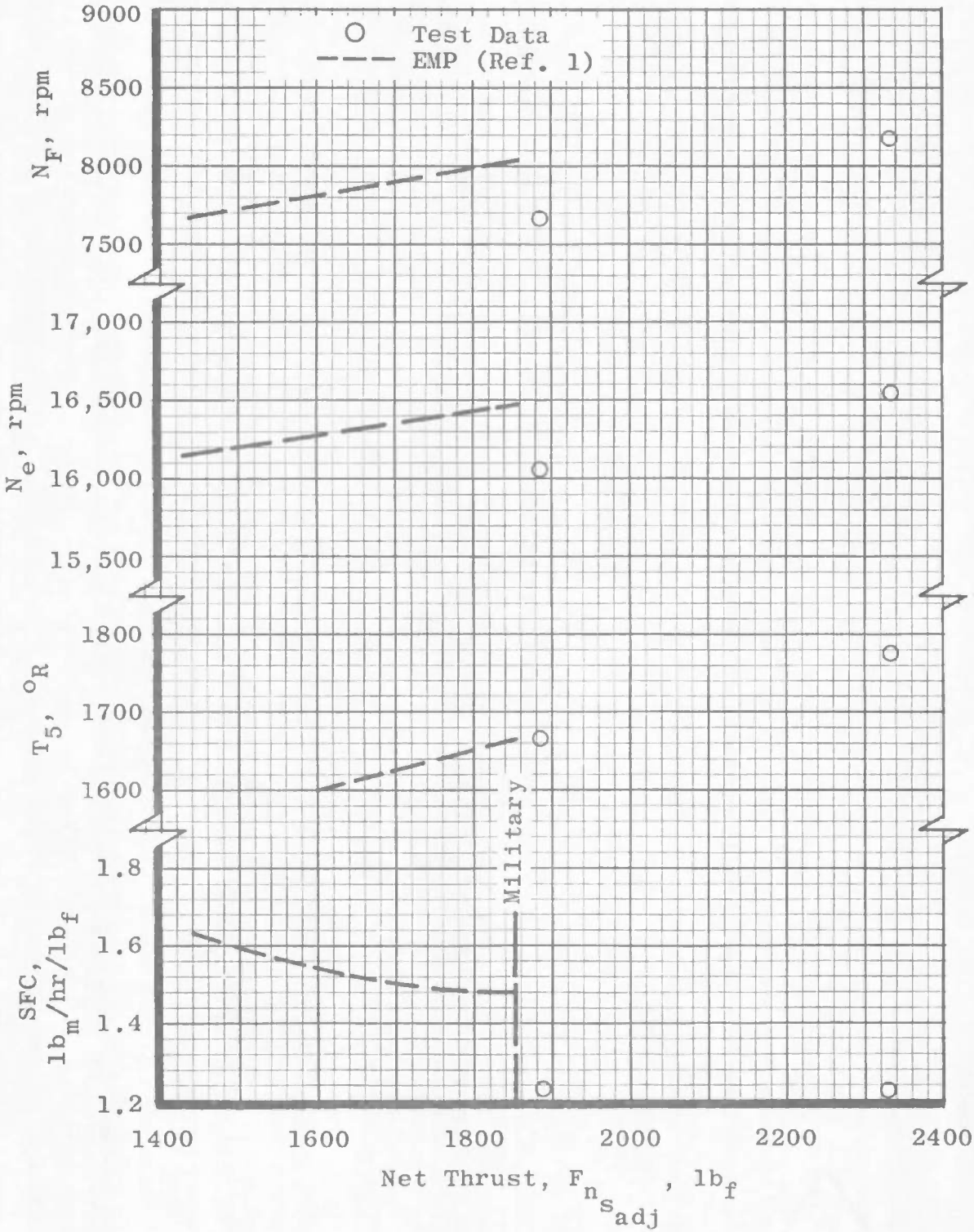
b. 7500-ft Altitude, Mach Number 0.95, Standard Atmosphere Performance

Fig. 9 Continued



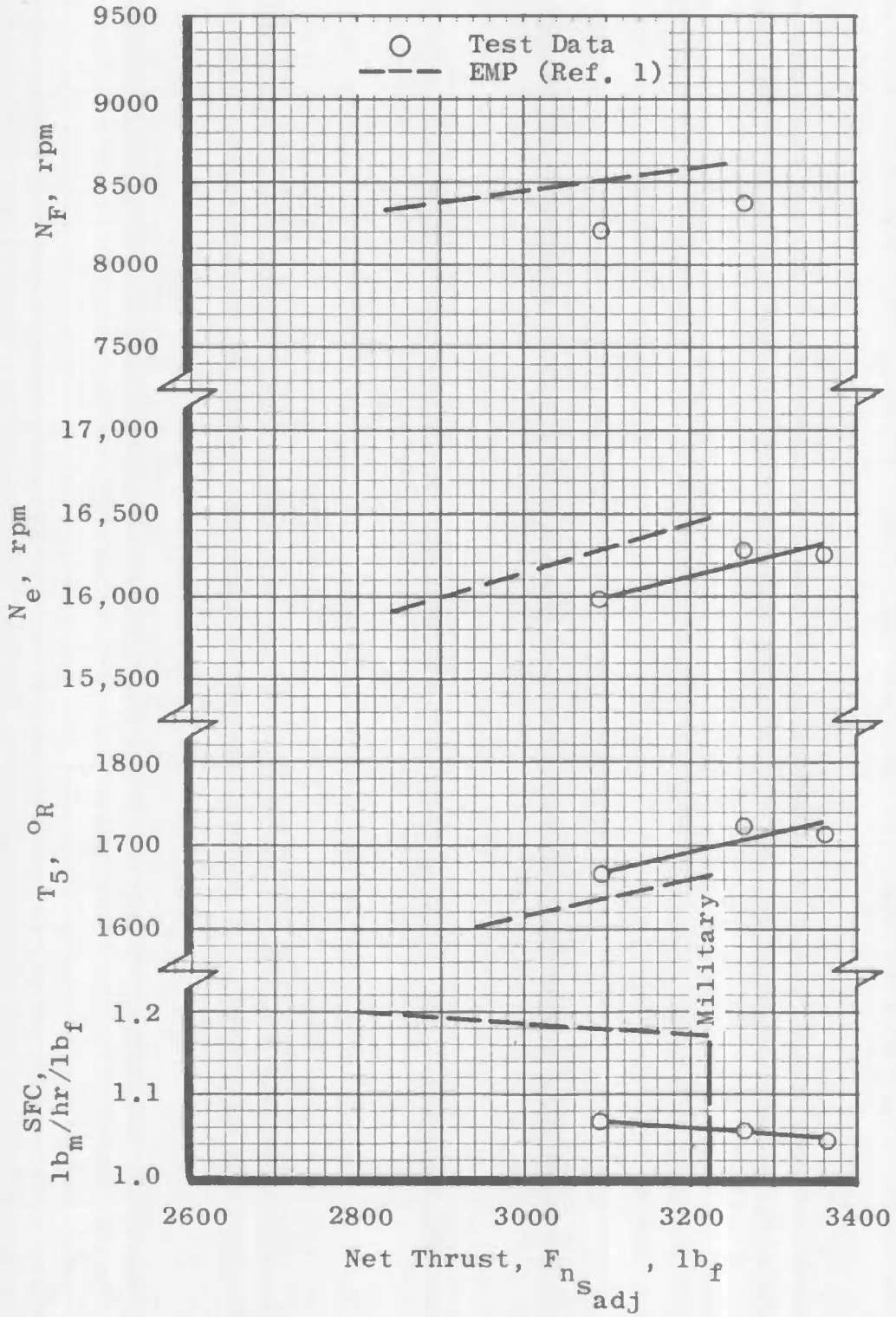
c. 36,089-ft Altitude, Mach Number 0.9, Standard Atmosphere Performance

Fig. 9 Continued



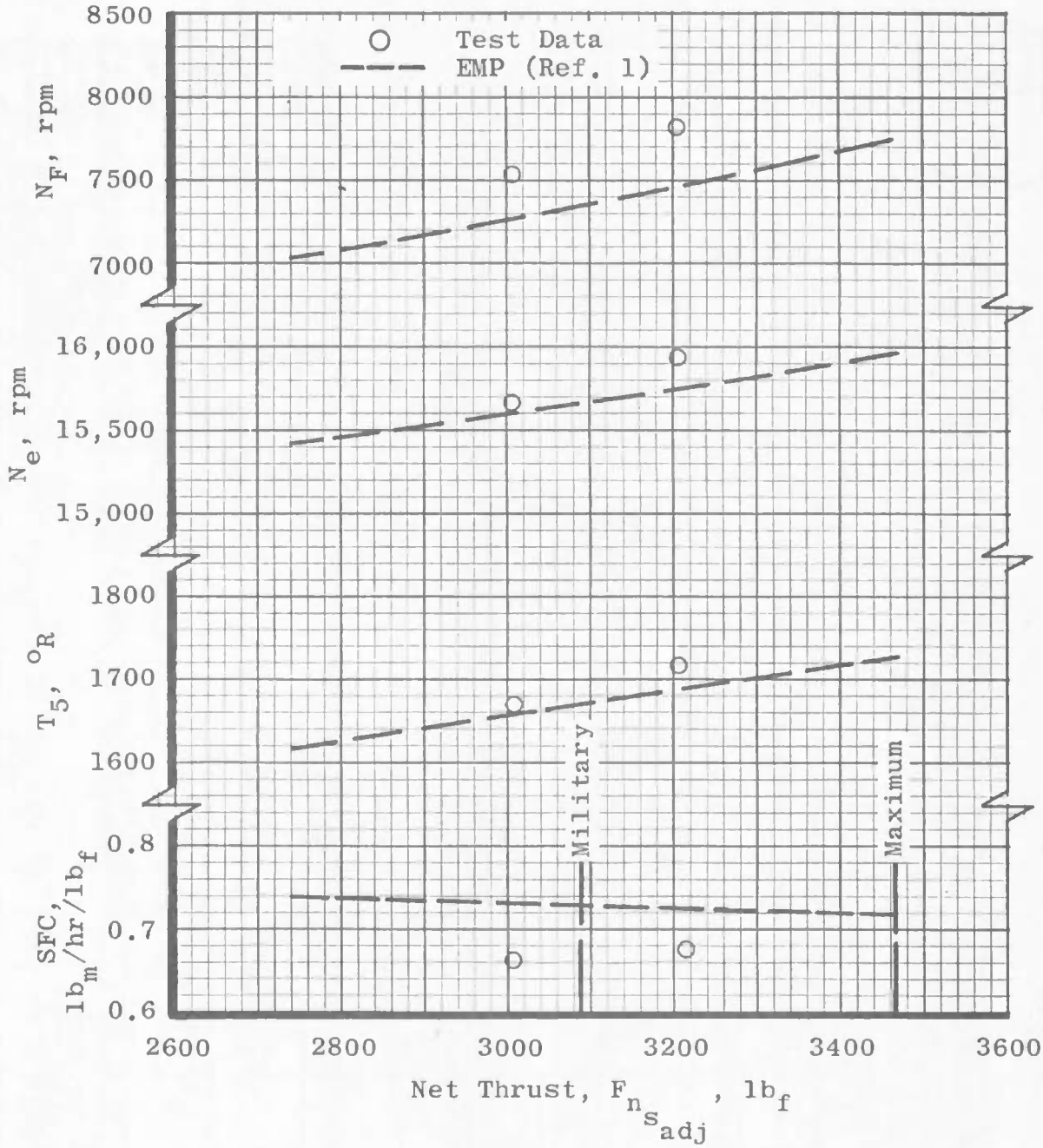
d. 7500-ft Altitude, Mach Number 1.0, Hot Atmosphere Performance

Fig. 9 Continued



e. 7500-ft Altitude, Mach Number 1.0, Cold Atmosphere Performance

Fig. 9 Continued



f. Sea-Level Static Hot Atmosphere Performance

Fig. 9 Concluded

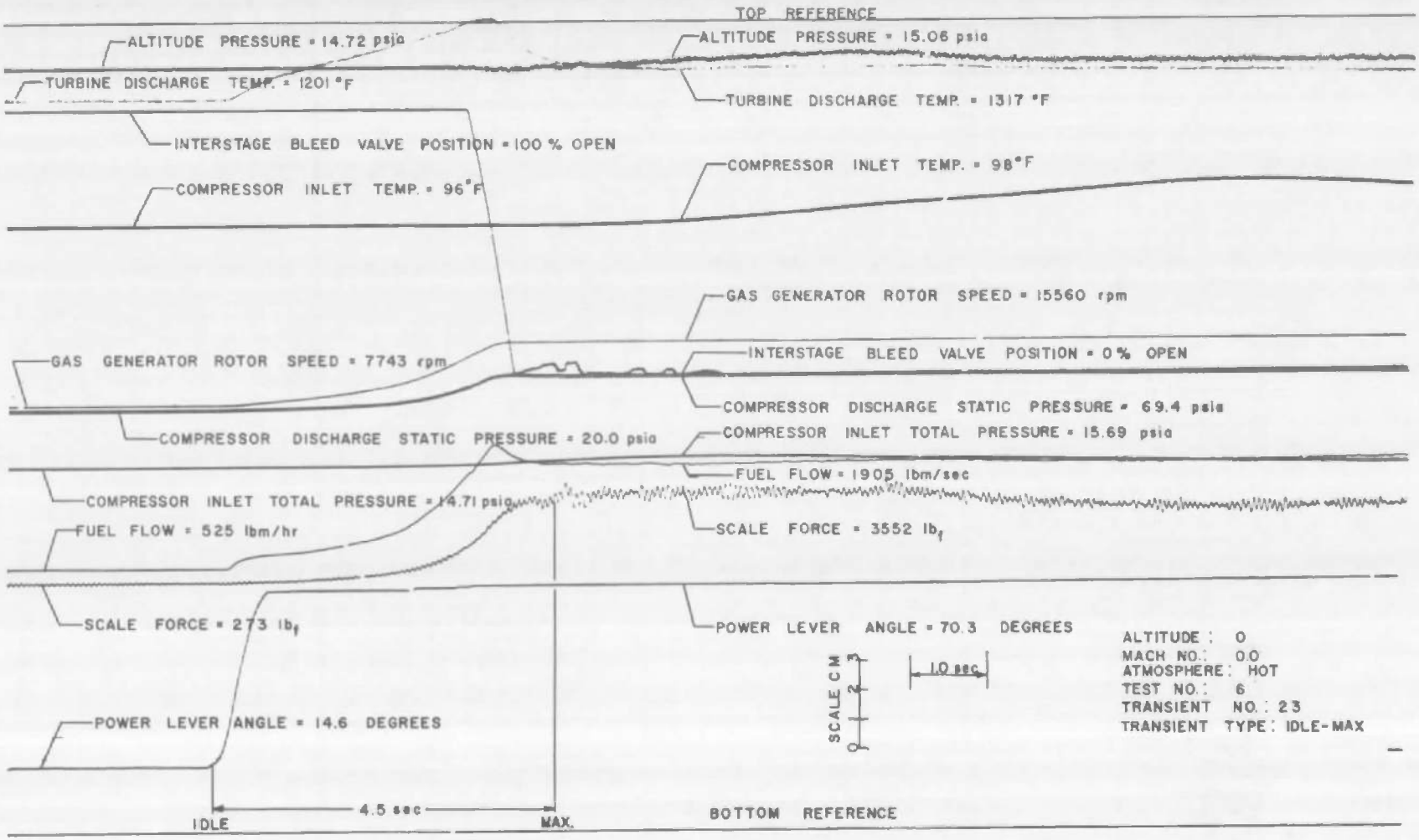
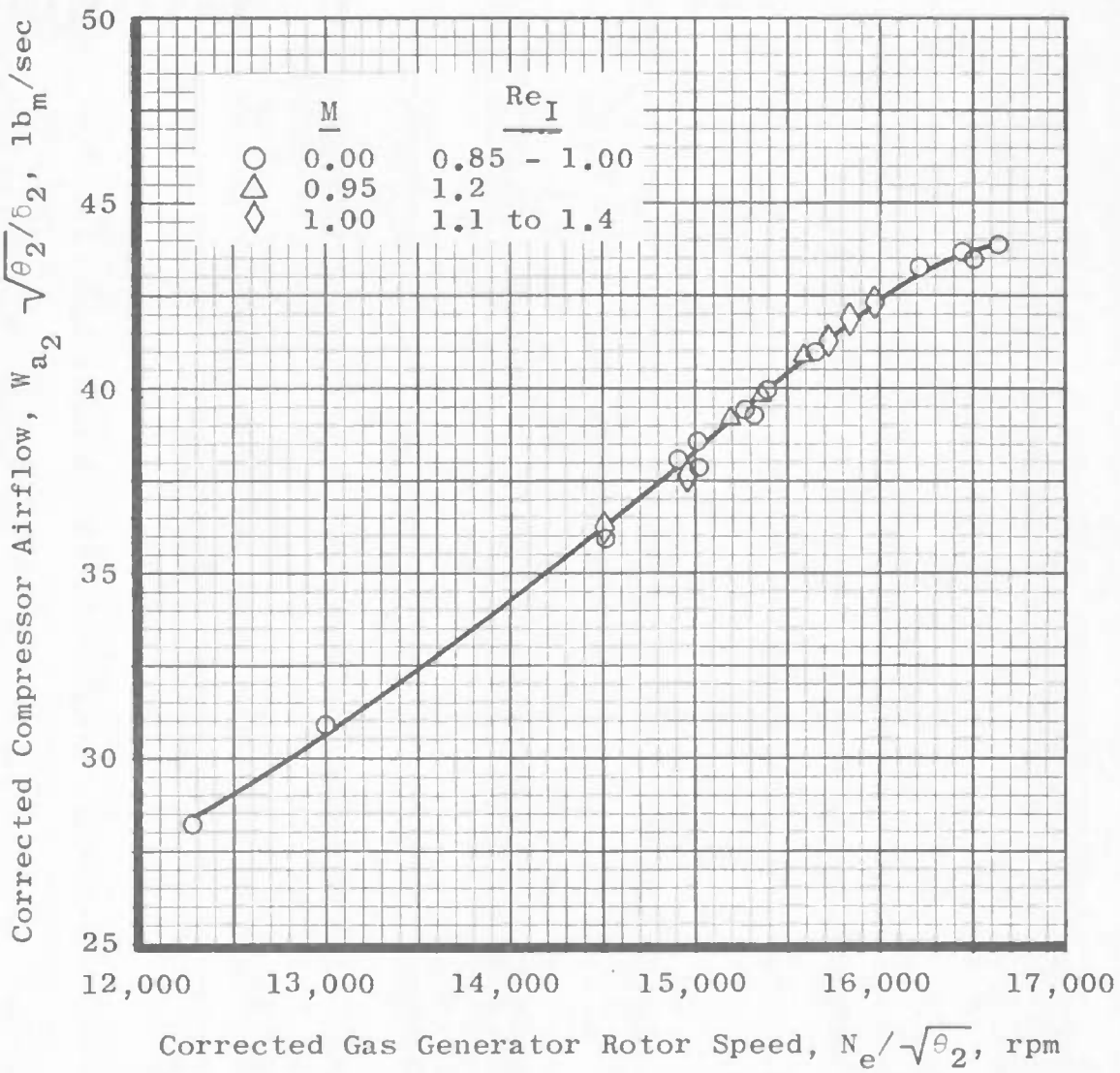
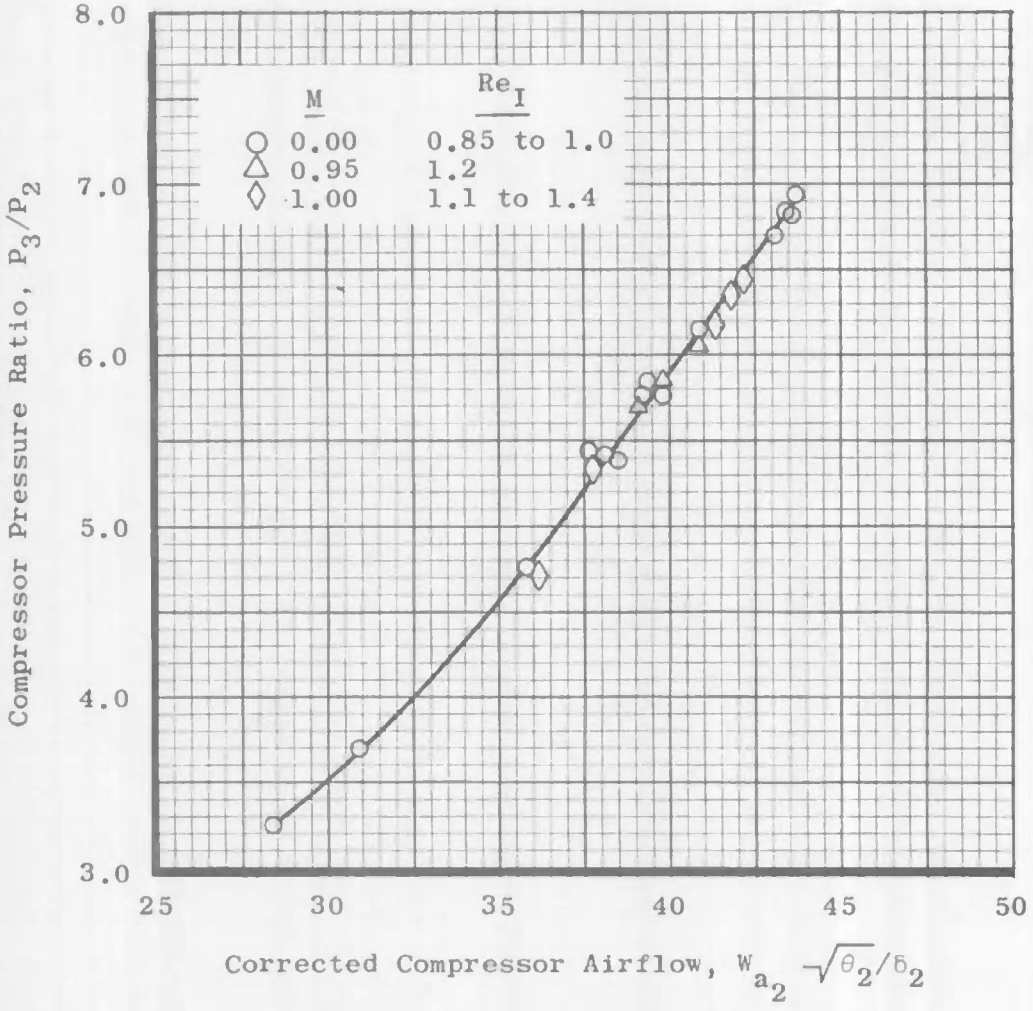


Fig. 10 Typical Acceleration from Idle to Maximum Power

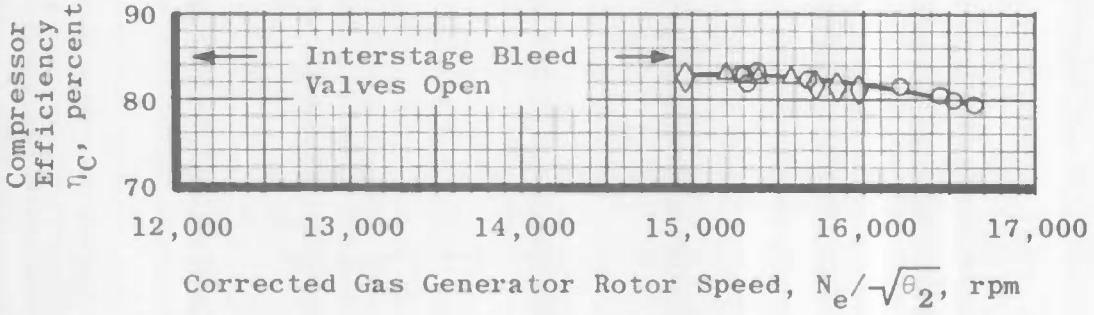


a. Corrected Compressor Airflow as a Function of Corrected Gos Generator Rotor Speed

Fig. 11 TF37-GE-1 Compressor Performance



b. Compressor Pressure Ratio as a Function of Corrected Compressor Airflow



c. Compressor Efficiency as a Function of Corrected Gas Generator Rotor Speed

Fig. 11 Concluded

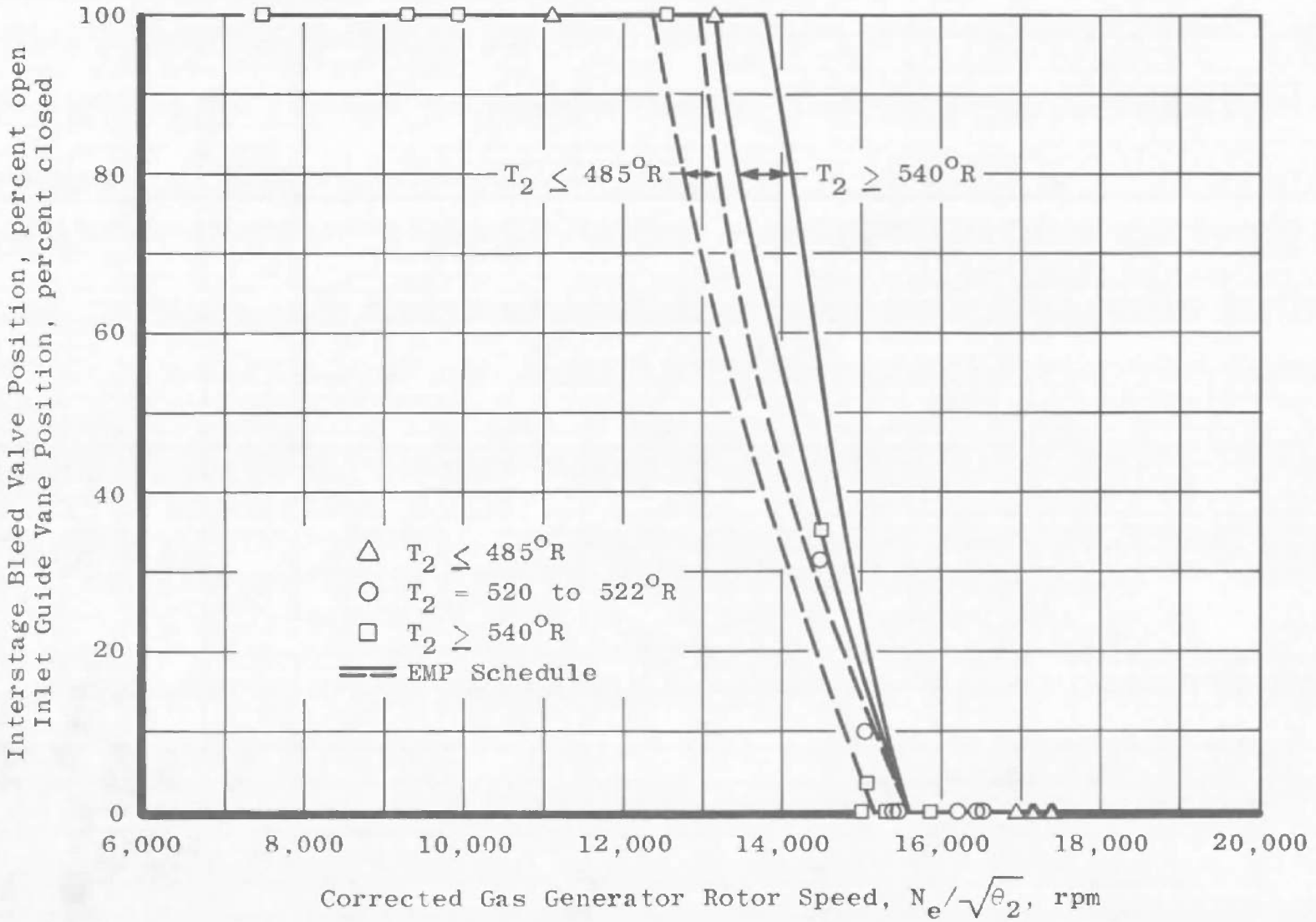
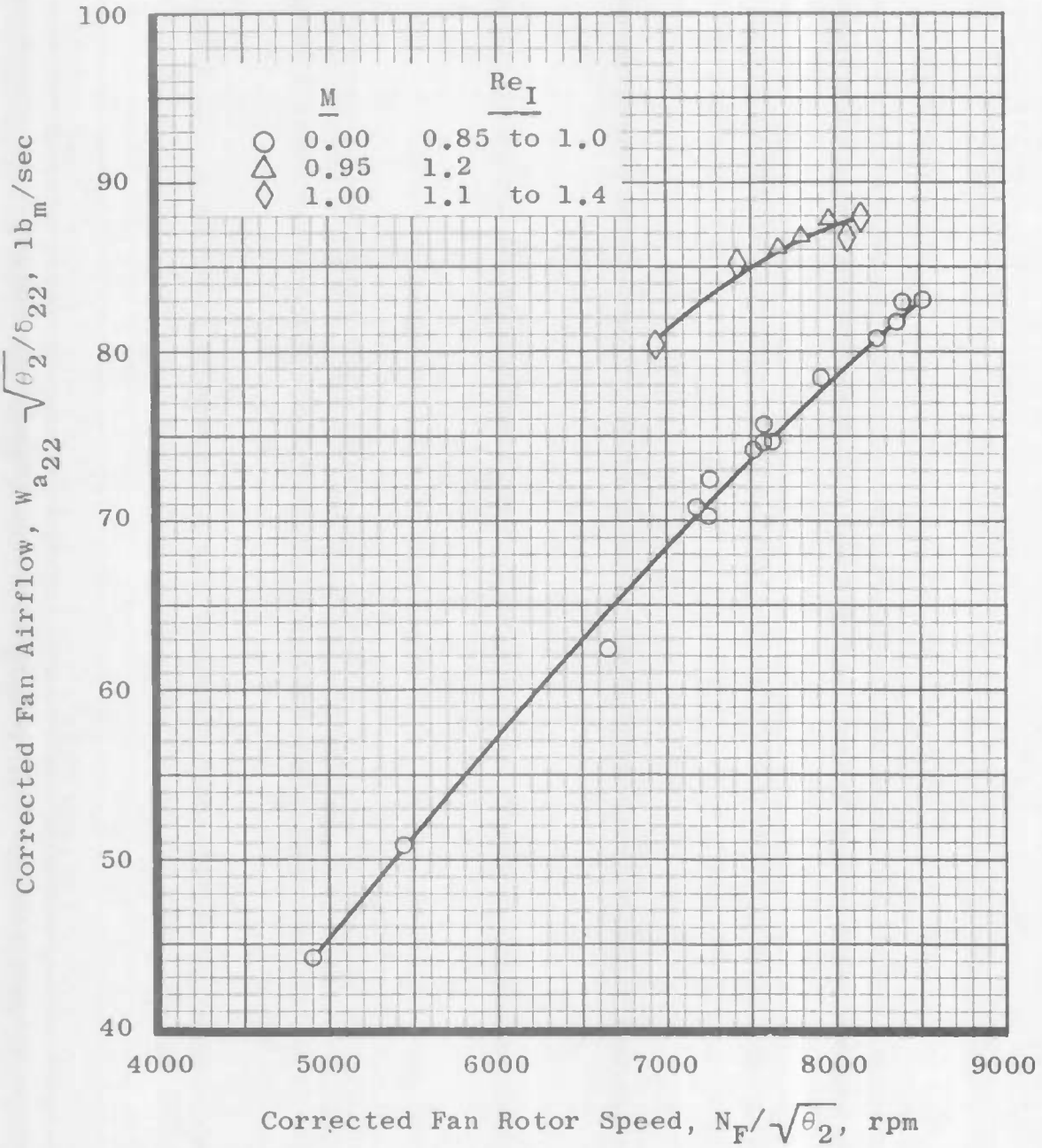
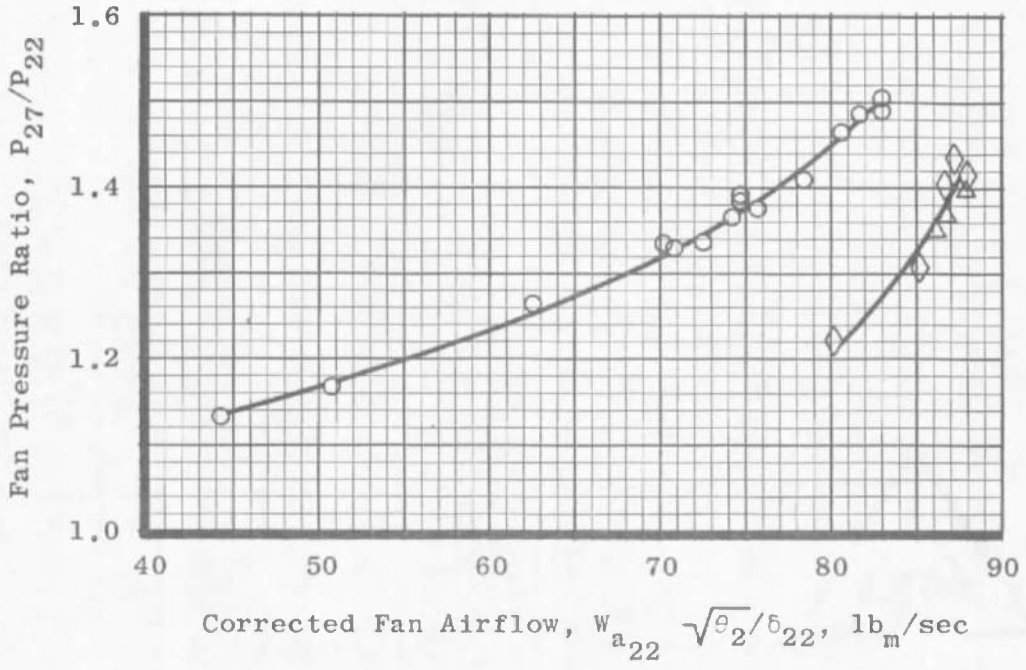


Fig. 12 Schedule of Interstage Bleed Valve and Inlet Guide Vane Position

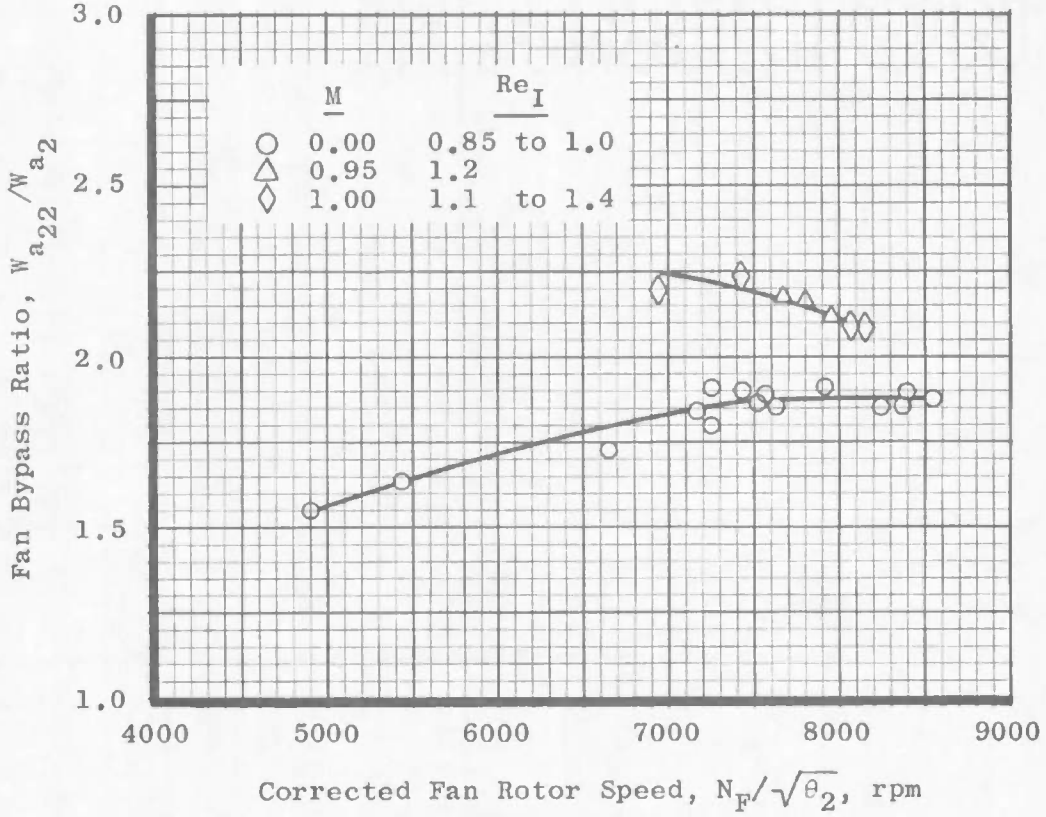


a. Corrected Fan Airflow as a Function of Corrected Fan Rator Speed

Fig. 13 TF37-GE-1 Fan Performance

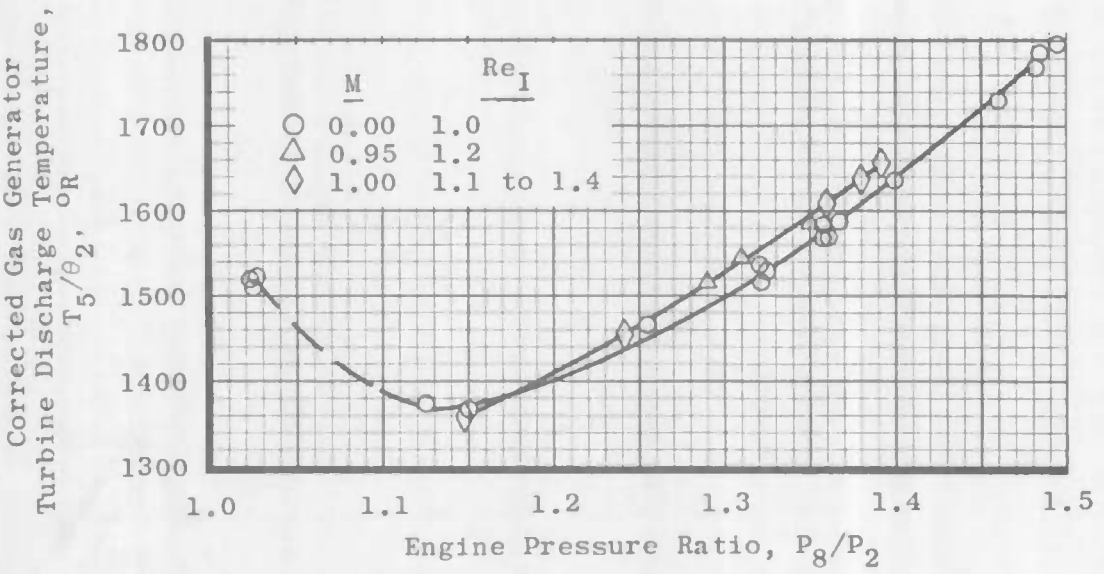


b. Fan Pressure Ratio as a Function of Corrected Fan Airflow

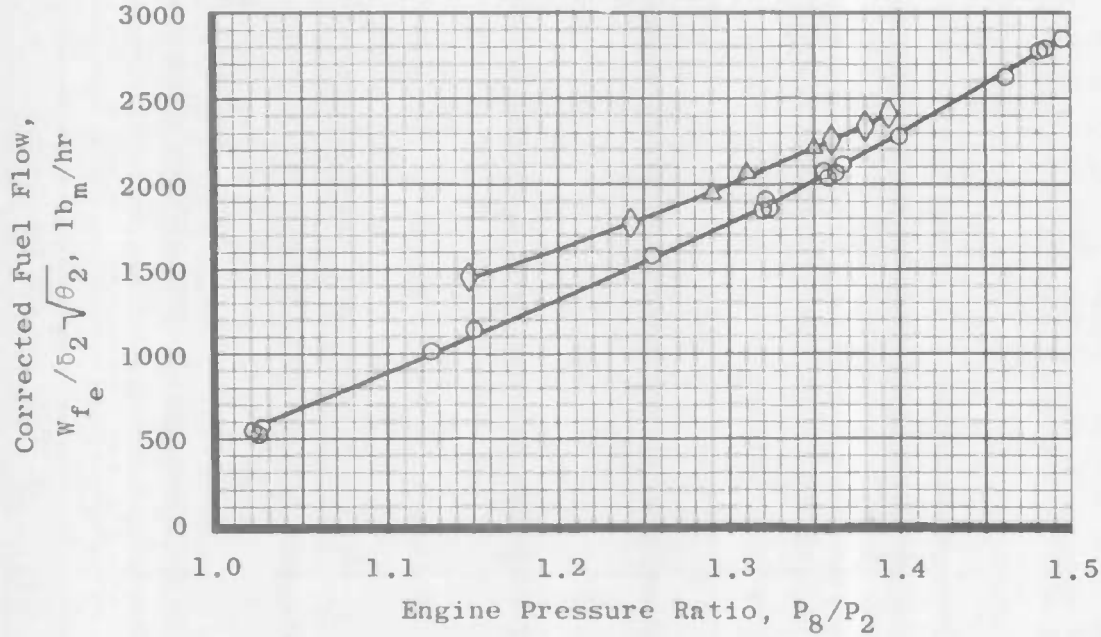


c. Bypass Ratio as a Function of Corrected Fan Rotor Speed

Fig. 13 Concluded



a. Corrected Gas Generator Turbine Discharge Temperature as a Function of Engine Pressure Ratio



b. Corrected Fuel Flow as a Function of Engine Pressure Ratio

Fig. 14 TF37-GE-1 Cycle Performance

TABLE I
STEADY-STATE INSTRUMENTATION

Parameter	Measuring Device	Range	Primary Recording Method	Estimated System Accuracy at Operating Level
Scale Force	Strain-Gage Load Cell	0 to 5000 lb_f	Analog-to-Digital Converter and Digital Computer	±0.5 percent
Fuel Flow	Turbine Flowmeters	200 to 4500 lb_m/sec	Manual Recording from Digital Electronic Frequency Counter	±0.5 percent
Rotor Speeds	Magnetic Pickups	1000 to 17,000 rpm	Manual Recording from Digital Electronic Frequency Counter	±20 rpm
Test Cell and Engine Pressures (Except Sta 3)	Manometers	0 to 40 psia	Photographs	±0.03 psi
Sta 3 Pressure	Calibrated Gages	0 to 150 psia	Photographs	±1.0 psi
Test Cell and Engine Temperature (Except Sta 5)	Iron-Constantan Thermocouples	0 to 650°F	Analog-to-Digital Converter and Digital Computer	±5°F
Sta 5 Temperature	Chromel®-Alumel® Thermocouples	0 to 1400°F	Analog-to-Digital Converter and Digital Computer	±10°F

TABLE II
TRANSIENT INSTRUMENTATION

Parameter	Symbol	Method of Calibration	Sensor	Range
Engine Rotor Speed	N_e	Variable Oscillator	Reluctance Pickup	0 to 16,700 rpm
Power Lever Angle	PLA	D-C Level	Wire-Wound Potentiometer	0 to 115 deg
Engine Fuel Flow	W_{f_e}	Strain-Gage Bridge Unbalanced to Simulate mv Output of Known Flow	Strain-Gage Type Flowmeter	200 to 3500 lb/hr
Compressor Interstage Bleed Valve Position	IBVP	D-C Level	Wire-Wound Potentiometer	0 to 100 percent Open
Scale Force	F_s	Strain-Gage Bridge Unbalanced to Simulate mv Output of Known Forces	Strain-Gage Load Cell	-2000 to 5000 lb_f
Compressor Discharge Static Pressure	P_3	Strain-Gage Bridge Unbalanced to Simulate mv Output of Known Forces	Strain-Gage Transducer	0 to 200 psia
Compressor Inlet Total Pressure	P_2	Strain-Gage Bridge Unbalanced to Simulate mv Output of Known Forces	Strain-Gage Transducer	0 to 25 psia
Altitude Ambient Pressure	P_o	Strain-Gage Bridge Unbalanced to Simulate mv Output of Known Forces	Strain-Gage Transducer	0 to 15 psia
Compressor Inlet Temperature	T_2	Known mv Signal to Simulate Thermocouple Output	I-C Thermocouple	-50 to 200°F
Turbine Discharge Temperature	T_5	Known mv Signal to Simulate Thermocouple Output	C-A Thermocouple	-50 to 1500°F

TABLE III
TF37-GE-1 ALTITUDE START SUMMARY

Altitude, ft	Mach Number	Inlet Total Pressure, psia	Altitude Pressure, psia	Inlet Total Temperature, °F	N_e, percent	Remarks
15,000	0.32	8.90	8.30	20.0	12.12	3 Starts
15,000	0.73	11.76	8.30	58.0	30.30	"
22,000	0.36	6.81	6.22	0.0	12.12	"
22,000	0.73	8.90	6.23	21.0	28.30	"
26,000	0.72	7.40	5.23	9.0	28.30	"
27,500	0.68	6.57	4.83	72.0	23.76	1 Start
32,000	0.86	6.43	3.99	70.7	30.50	"

TABLE IV
TRANSIENT PERFORMANCE SUMMARY

Altitude, ft	Mach Number	Atmosphere	Test Number	Transient Number	Transient Type	Elapsed Time, sec
0	0.0	Hot	6	18	MAX-MIL	1.3
0	0.0	Hot	6	19	MIL-MAX	1.5
0	0.0	Hot	6	20	MAX-IDLE	3.1
0	0.0	Hot	6	21	IDLE-MIL	4.8
0	0.0	Hot	6	22	MIL-IDLE	2.5
0	0.0	Hot	6	23	IDLE-MAX	4.5
0	0.0	Hot	6	24	MAX-IDLE	2.9
7500	1.0	Cold	6	34	IDLE-MAX	3.3
7500	1.0	Cold	6	35	MAX-IDLE	3.6
7500	1.0	Cold	6	36	IDLE-MIL	3.6
7500	1.0	Cold	6	37	MIL-IDLE	3.5
7500	1.0	Hot	6	42	MIL-MAX	2.2
7500	1.0	Hot	6	43	MAX-MIL	2.6
7500	1.0	Hot	6	45	IDLE-MAX	3.0
7500	1.0	Hot	6	46	MAX-IDLE	7.2
7500	1.0	Hot	6	47	IDLE-MIL	2.7
7500	1.0	Hot	6	48	MIL-IDLE	3.5

APPENDIX I
TABULATED STEADY-STATE DATA

Each test is identified as follows:

PN RB0411 TEST 02 TD 09-23-65

Project Number	RB0411
Test Number	02
Test Date	09-23-65

Values are listed showing the sign, four significant digits, and the sign and associated power of ten; e. g.,

$$.9548\ -01 = 0.9548 \times 10^{-1} = 0.09548, \text{ and}$$

$$-.9548\ +02 = -0.9548 \times 10^{2} = -95.48$$

INDEX TO STEADY-STATE DATA

Altitude, ft	Mach Number	Power Lever Angle, deg	Ne, rpm	Page No.	Test No.	Point No.
Standard Atmosphere						
0	0.00	39.40	13,120	49	*02	2
		54.50	15,330	50		3
		76.50	16,650	51		4
		53.00	15,330	52		5
		35.10	12,350	53		6
		14.60	7,460	54	04	1
		46.80	14,530	55		2
		51.60	15,090	56		3
		55.90	15,440	57		4
		60.20	15,680	58		5
		70.30	16,260	59		6
		74.10	16,500	60		7
		75.20	16,570	61		8
		50.50	15,050	62		9
7,500	0.95	73.60	16,510	63	04	11
		69.30	16,250	64		12
		67.60	16,140	65		13
36,000	0.90	73.40	16,240	67	05	1
		73.40	16,210	68		2
		69.60	15,990	69		3
		14.60	10,590	70		4
Hot Atmosphere						
0	0.00	14.50	7,840	66	04	14
		14.60	7,786	71	06	1
		60.70	15,660	72		2
		65.00	15,950	73		3
7,500	1.00	15.70	10,990	78	06	8
		77.30	16,540	79		9
		68.20	16,060	80		10
Cold Atmosphere						
7,500	1.00	15.70	10,410	74	06	4
		70.30	16,250	75		5
		70.30	16,280	76		6
		65.50	15,990	77		7

*Inlet Screens Installed

NOMENCLATURE

1	2	Description
---	ADPLS	Lab seal area x (aft cell pressure altitude-ambient pressure)
---	ALTD	Altitude setting condition, ft
Atmos	ATMOS	Atmosphere setting condition (cold, std, hot)
---	CD	Jet nozzle discharge coefficient
---	CF	Jet nozzle thrust coefficient
δ_2	DELTA 2	Ratio of compressor inlet pressure to sea-level standard pressure
δ_{22}	DELTA 22	Ratio of fan inlet pressure to sea-level standard pressure
---	DH45/RT4	Basic engine turbine work parameter
---	DH57/RT5	Fan turbine work parameter
η_B	EFFBURN	Burner efficiency, percent
η_c	EFFCOMP	Compressor efficiency, percent
η_F	EFFFAN	Fan efficiency, percent
f_e	FE	Fuel-air ratio
---	FEC	Corrected fuel-air ratio
---	FJ/A8POS	Gross thrust parameter
---	FJC	Corrected jet (gross) thrust, lb_f
$F_{j_{s_{adj}}}$	FJD	Adjusted jet (gross) thrust, lb_f
F_{j_s}	FJS	Jet (gross) thrust, lb_f

[1] Equivalent symbols used in text.

[2] Symbols used in machine tabulation of data presented in Appendix I.

1	2	Description
---	FNC	Corrected net thrust, lb_f
$F_{n_{s_{adj}}}$	FND	Adjusted net thrust, lb_f
F_{n_s}	FNS	Net thrust, lb_f
F_r	FR	Ram drag, lb_f
---	FRC	Corrected ram drag, lb_f
F_s	FS	Scale force, lb_f
---	HL	Lower heating value of fuel, Btu/lb_m
---	IBVP	Intercompressor bleed valve position, percent
---	JNA	Jet nozzle area, ft^2
M	MACHD	Mach number setting condition
m_1V_1	M1V1	Station 1 momentum
N_e	NE	Basic engine rotor speed, rpm
$N_e/\sqrt{\theta_2}$	NEC	Corrected basic engine rotor speed, rpm
---	NECPC	Corrected basic engine rotor speed, percent
---	NEPC	Basic engine rotor speed, percent
---	NE/NF	Rotor speed ratio
---	NE/RT4	Basic engine turbine speed parameter
$N_F/\sqrt{\theta_{22}}$	NFC	Corrected fan rotor speed, rpm
N_F	NF	Fan rotor speed, rpm
---	NFCPC	Corrected fan rotor speed, percent
---	NFPC	Fan rotor speed, percent
---	NF/RT5	Fan turbine speed parameter
---	PLP	Power lever position, deg
---	POINT	Data point number
p_{1n}	P1NS	Venturi throat static pressure, psia

1	2	Description
p_{1n}/P_{00}	P1NS/P00	
---	P1S	Area weighted station 1 static pressure, psia
---	P1SA1	Station 1 static pressure X area
P_2	P2	Compressor inlet total pressure, psia
---	P2S	Compressor inlet static pressure, psia
P_2/p_0	P2/P0S	Ram pressure ratio
P_{22}	P22	Fan inlet total pressure, psia
---	P22S	Fan inlet static pressure, psia
P_{27}	P27	Fan exit total pressure, psia
P_{27}/P_{22}	P27/P22	Fan pressure ratio
P_3	P3	Compressor exit total pressure, psia
P_3/P_2	P3/P2	Compressor pressure ratio
---	P7	Confluent tailpipe total pressure, psia
---	P7S	Confluent tailpipe static pressure, psia
---	P7/P2	Ratio of confluent tailpipe pressure to inlet pressure
---	P7/P8	Tailpipe pressure ratio
P_8	P8	Jet nozzle exit total pressure, psia
P_8/P_2	P8/P2	Overall engine pressure ratio
P_8/p_0	P8/P0S	Jet nozzle pressure ratio
P_{00}	P00	Plenum total pressure, psia
P_0	P0S	Altitude ambient pressure, psia
P_{OX}	POX	Cell aft static pressure, psia
---	POXA1	Aft cell static pressure x area
---	POX/POUT	Ratio of aft cell pressure to pressure outside cell
Re_I	REI	Reynolds number index
$\sqrt{\theta_2}$	RTHETA2	Square root of ratio of compressor inlet temperature to sea-level standard temperature

1	2	Description
$\sqrt{\theta_{22}}$	RTHETA22	Square root of ratio of fan inlet temperature to sea-level standard temperature
SFC	SFC	Specific fuel consumption
---	SFCC	Corrected specific fuel consumption
---	SFCCGE	$SFC/\theta_2^{0.718}$
---	SFCD	Adjusted specific fuel consumption
---	TFE	Fuel temperature at meter, °R
θ_2	THETA2	Ratio of compressor inlet temperature to sea-level standard temperature
θ_{22}	THETA22	Ratio of fan inlet temperature to sea-level standard temperature
T_2	T2	Basic engine inlet temperature, °R
---	T22	Fan inlet temperature, °R
---	T27	Fan exit temperature, °R
---	T27C	Corrected fan exit temperature, °R
---	T22.1X	Calculated fan inlet temperature, °R
---	T22.1XC	Corrected calculated fan inlet temperature, °R
---	T27C	Corrected fan exit temperature, °R
---	T3	Compressor exit temperature, °R
---	T3C	Corrected compressor exit temperature, °R
---	T4X	Calculated burner exit temperature, °R
---	T4XC	Corrected calculated burner exit temperature, °R
T_5	T5	Basic engine turbine exit temperature, °R
T_5/θ_2	T5C	Corrected basic engine turbine exit temperature, °R
---	T5.1X	Calculated basic engine turbine exit temperature, °R

1	2	Description
---	T5.1XC	Corrected calculated basic engine turbine exit temperature, °R
---	T7X	Calculated confluent tailpipe temperature, °R
---	T7XC	Corrected calculated confluent tailpipe temperature, °R
V_O	VO	Flight velocity, fps
---	VOD	Adjusted flight velocity, fps
---	VOK	Flight velocity, knots
---	VODK	Adjusted flight velocity, knots
$W_{a_{1n}}$	WA1N	Venturi airflow, lb_m/sec
W_{a_2}	WA2	Compressor inlet airflow, lb_m/sec
$W_{a_2}\sqrt{\theta_2}/\delta_2$	WA2C	Corrected compressor inlet airflow, lb_m/sec
$W_{a_{2_{adj}}}$	WA2D	Adjusted engine airflow, lb_m/sec
$W_{a_{22}}$	WA22	Fan inlet airflow, lb_m/sec
$W_{a_{22}}\sqrt{\theta_{22}}/\delta_{22}$	WA22C	Corrected fan inlet airflow, lb_m/sec
$W_{a_{22_{adj}}}$	WA22D	Adjusted fan airflow, lb_m/sec
$W_{a_{22}}/W_{A_{22}}$	WA22/WA22	Bypass ratio
$W_{a_{27}}$	WA27	Fan exit airflow, lb_m/sec
---	WA3	Compressor exit airflow, lb_m/sec
---	WAFBM	Fan bellmouth calculated airflow, lb_m/sec
---	WAFBM/WA22	Ratio of fan bellmouth calculated airflow to fan inlet airflow
W_{f_e}	WFE	Engine fuel flow, lb_m/hr
$W_{f_e}/\delta_2\sqrt{\theta_2}$	WFEC	Corrected engine fuel flow, lb_m/hr

1	2	Description
---	WFED	Adjusted engine fuel flow, lb_m/hr
W_{g_4}	WG4	Burner exit gas flow, lb_m/sec
W_{g_5}	WG5	Basic engine turbine exit gas flow, lb_m/sec
W_{g_7}	WG7	Confluent tailpipe gas flow, lb_m/sec
W_{g_8}	WG8	Jet nozzle exit gas flow, lb_m/sec
---	WRT/P3.1	Burner inlet flow parameter
---	WRT/P27	Fan exit flow parameter
---	WRT/P7	Confluent tailpipe flow parameter

PN RBC411 TEST 02 TD C9-23-65

PCINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.2CC0+01	.0000+0C	.0000+00	.0000+0C	.3940+02	.2500+01	.6250+02	.1312+05	.5482+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.187C+05	.1202+C4	.1426+04	.5464+03	.5283+03	.8033+03	.1643+04	.1391+04	.1304+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5283+03	.5748+03	.8312+C3	.1019+01	.10C9+01	.1019+01	.1009+01	.1032+01	.1028+01
P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.1671+02	.1103+02	.1516+02	.1423+02	.5605+02	.1511+02	.1443+02	.1763+02	.1760+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1504+02	.1746+02	.15C0+C2	.1518+02	.1518+02	.7887+03	.1613+04	.1366+04	.1280+04
T27C	T7XC	T22.1X	T22.1XC	PINS/P00	P2/POS	P3/P2	P27/P22	P7/P2
.5643+03	.8160+03	.5358+03	.5260+03	.6602+00	.1011+01	.3696+01	.1167+01	.1160+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1151+01	.1164+01	.1008+01	.8470+02	.3164+02	.5314+02	.5931+02	.3164+02	.3109+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.3109+02	.5371+02	.8458+02	.8458+02	.1679+01	.1116+01	.3095+02	.5217+02	.1555+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.7302+02	.1386+03	.8596+00	.6222+00	.1093+01	.3237+03	.1670+01	.1470+03	.3844+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9922+0C	.1025+01	.13C0+05	.5432+04	.2393+01	.1154+04	.1066-01	.1682+04	.3542+03
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.1328+04	.8689+00	.10C8+C1	.3215+00	.1736+04	.3655+03	.1371+04	.8769+00	.1393+03
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.8255+02	.5172+02	.3067+02	.1683+04	.1329+04	.8769+00	.1165+04	.1393+03	.8255+02
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.7879+02	.6002+02	.7952+02	.6057+02	.8654+00	.1515+03	.2614+06	.2613+06	.1590+03
POX/PDUT	FE							
.1C70+01	.1086-01							

Inlet Screens Installed

PN RB0411 TEST 02 TD 09-23-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.3000+01	.0000+00	.0000+00	.0000+00	.5450+02	.2500+01	.0000+00	.1533+05	.7586+04

HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1870+05	.2041+04	.3230+04	.5472+03	.5215+03	.9230+03	.1931+04	.1576+04	.1562+04

T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5215+03	.5956+03	.9044+03	.1005+01	.1003+01	.1005+01	.1003+01	.1002+01	.9921+00

P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.2116+02	.1095+02	.1472+02	.1317+02	.8514+02	.1458+02	.1335+02	.2001+02	.2033+02

P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1548+02	.2000+02	.1488+02	.1469+02	.1471+02	.9180+03	.1921+04	.1567+04	.1554+04

T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.5923+03	.8995+03	.5307+03	.5278+03	.5174+00	.9890+00	.5785+01	.1373+01	.1381+01

P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1359+01	.1344+01	.1017+01	.1127+03	.3923+02	.7379+02	.7729+02	.3923+02	.3870+02

WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.3870+02	.7450+02	.1129+03	.1129+03	.1881+01	.1047+01	.3928+02	.7458+02	.1361+02

WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9085+02	.1670+03	.8295+00	.7754+00	.9952+00	.3488+03	.2252+01	.1911+03	.4422+01

CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9495+00	.9893+00	.1529+05	.7565+04	.2021+01	.2033+04	.1479-01	.3202+04	.0000+00

FNC	SFCC	REI	FJ/ABPOS	FJS	FR	FNS	SFC	V0
.3202+04	.6348+00	.9946+00	.5987+00	.3207+04	.0000+00	.3207+04	.6365+00	.0000+00

V0K	WA22D	WA2D	FJD	FND	SFCD	WFED	V0D	V0KD
.0000+00	.0000+00	.0000+00	.0000+00	.0000+00	.0000+00	.0000+00	.0000+00	.0000+00

NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	P0XA1	ADPLS
.9264+02	.8360+02	.9290+02	.8382+02	.6340+00	.1310+03	.2530+06	.2533+06	-.1536+03

P0X/P0UT	FE
.1038+01	.1487-01

Inlet Screens Installed

PN RB0411 TEST 02 TD 09-23-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.4000+01	.0000+00	.0000+00	.0000+00	.7650+02	.2500+01	.9980+02	.1665+05	.8522+04
HL	WFE	FS	TFC	T2	T3	T4X	T5	T5.1X
.1870+05	.2960+04	.4008+04	.5433+03	.5186+03	.9905+03	.2201+04	.1795+04	.1793+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5186+03	.6184+03	.9944+03	.9997+00	.9999+00	.9997+00	.9999+00	.1002+01	.9897+00
POO	PINS	P2	P2S	P3	P22	P22S	P27	P7
.2353+02	.1216+02	.1472+02	.1273+02	.1022+03	.1454+02	.1296+02	.2189+02	.2250+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1618+02	.2203+02	.1476+02	.1467+02	.1470+02	.9908+03	.2202+04	.1795+04	.1794+04
T27C	T7XC	T22.1X	T22.1XC	PINS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.6186+03	.9946+03	.5301+03	.5303+03	.5170+00	.9974+00	.6942+01	.1505+01	.1529+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1497+01	.1493+01	.1022+01	.1256+03	.4384+02	.8215+02	.8642+02	.4384+02	.4341+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.4341+02	.8294+02	.1260+03	.1260+03	.1874+01	.1052+01	.4376+02	.8299+02	.1313+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9423+02	.1766+03	.7930+00	.7434+00	.9814+00	.3549+03	.2477+01	.2011+03	.5061+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9355+00	.9564+00	.1665+05	.8523+04	.1954+01	.2856+04	.1865-01	.4178+04	.0000+00
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VD
.4178+04	.6835+00	.1002+01	.7977+00	.4185+04	.0000+00	.4185+04	.6834+00	.0000+00
VOK	WA2?C	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.0000+00	.8303+02	.4378+02	.4179+04	.4179+04	.6834+00	.2856+04	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	P1V1	P1SA1	POXA1	ADPLS
.1009+03	.9418+02	.1009+03	.9417+02	.6836+00	.2291+03	.2526+06	.2531+06	-.5240+02
POX/POUT	FE							
.1037+01	.1864-01							

Inlet Screens Installed

PN RB0411 TEST 02 TD 09-23-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.5000+01	.0000+00	.0000+00	.0000+00	.5300+02	.2500+01	.9980+02	.1533+05	.7595+04

HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1870+05	.2078+04	.3251+04	.5464+03	.5196+03	.9226+03	.1927+04	.1570+04	.1566+04

T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5196+03	.5969+03	.9018+03	.1002+01	.1001+01	.1002+01	.1001+01	.1009+01	.9994+00

P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.2153+02	.1113+02	.1482+02	.1326+02	.8645+02	.1469+02	.1341+02	.2022+02	.2055+02

P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1555+02	.2021+02	.1487+02	.1480+02	.1482+02	.9211+03	.1924+04	.1567+04	.1564+04

T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.5959+03	.9003+03	.5287+03	.5278+03	.5168+00	.9965+00	.5833+01	.1377+01	.1387+01

P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1363+01	.1359+01	.1017+01	.1150+03	.3971+02	.7557+02	.7891+02	.3971+02	.3917+02

WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.3917+02	.7629+02	.1152+03	.1152+03	.1903+01	.1044+01	.3940+02	.7568+02	.1356+02

WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH5T/RT5
.9218+02	.1683+03	.8279+00	.7422+00	.9854+00	.3493+03	.2263+01	.1917+03	.4406+01

CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9461+00	.9982+00	.1532+05	.7589+04	.2019+01	.2059+04	.1493-01	.3322+04	.0000+00

FNC	SFCC	RE1	FJ/A8POS	FJS	FR	FNS	SFC	V0
.3322+04	.6197+00	.1007+01	.6258+00	.3351+04	.0000+00	.3351+04	.6202+00	.0000+00

VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	V0D	VOKD
.0000+00	.7565+02	.3938+02	.3323+04	.3323+04	.6202+00	.2061+04	.0000+00	.0000+00

NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.9284+02	.8385+02	.9292+02	.8392+02	.6195+00	.1519+03	.2549+06	.2551+06	-.5195+02

POX/POUT	FE
.1043+01	.1496-01

Inlet Screens Installed

PN RB0411 TEST 02 TO 09-23-65

PCINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.6000+01	.0000+00	.0000+00	.0000+00	.3510+02	.2500+01	.7410+02	.1235+05	.4922+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1870+05	.1036+04	.1174+04	.5417+03	.5241+03	.7648+03	.1612+04	.1391+04	.1262+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5241+03	.5716+03	.8195+03	.1010+01	.1005+01	.1010+01	.1005+01	.1015+01	.1013+01
P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.1618+02	.1221+02	.1492+02	.1415+02	.4870+02	.1488+02	.1435+02	.1686+02	.1689+02
P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1489+02	.1678+02	.1484+02	.1493+02	.1493+02	.7569+03	.1596+04	.1377+04	.1250+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.5657+03	.8111+03	.5315+03	.5260+03	.7544+00	.1006+01	.3264+01	.1133+01	.1132+01
P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1125+01	.1131+01	.1007+01	.7483+02	.2872+02	.4621+02	.5267+02	.2872+02	.2821+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.2821+02	.4672+02	.7473+02	.7473+02	.1609+01	.1140+01	.2843+02	.4586+02	.1585+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.6626+02	.1266+03	.8669+00	.4814+00	.1153+01	.3077+03	.1474+01	.1320+03	.3919+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9873+00	.1007+01	.1229+05	.4897+04	.2510+01	.1015+04	.1020-01	.1334+04	.2298+03
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.1104+04	.9195+00	.1002+01	.2536+00	.1355+04	.2334+03	.1121+04	.9243+00	.1007+03
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.5965+02	.4564+02	.2830+02	.1334+04	.1105+04	.9243+00	.1021+04	.1007+03	.5965+02
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.7449+02	.5411+02	.7487+02	.5439+02	.9174+00	.9425+02	.2572+06	.2571+06	.8591+02
P0X/P0UT	FE							
.1051+01	.1031-01							

Inlet Screens Installed

PN REC411 TEST C04 TC C9-27-65

PCINT	ALTC	MACHC	ATMOS	PLP	JNA	IBVP	NE	NF
.1CC0+01	.0000+00	.0000+00	.0000+00	.1460+02	.2500+01	.9090+02	.7460+04	.0000+00
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.5668+03	.2862+03	.5344+03	.5220+03	.6105+03	.1611+04	.1531+04	.1366+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5220+03		.8720+03	.1006+01	.1003+01	.1006+01	.1003+01	.1005+01	.1005+01
POO	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.1496+02	.1434+02	.1477+02	.1462+02	.2319+02	.1477+02	.1467+02	.1521+02	.1520+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1482+02	.1519+02	.1489+02	.1477+02	.1478+02	.6067+03	.1600+04	.1521+04	.1357+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.5485+03	.8665+03	.5310+03	.5277+03	.9580+00	.9919+00	.1570+01	.1030+01	.1029+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1028+01	.1020+01	.1001+01	.3239+02	.1280+02	.1957+02	.2303+02	.1280+02	.1260+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.1260+02	.1980+02	.3231+02	.3231+02	.1528+01	.1177+01	.1278+02	.1953+02	.1326+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.3058+02	.6275+02	.8097+00		.1115+01	.1859+03	.5378+00	.0000+00	.4369+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.1146+01	.8369+00	.7436+04	.0000+00	.0000+00	.5621+03	.1257-01	.2025+03	.0000+00
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.2025+03	.2776+01	.9971+00	.3797-01	.2036+03	.0000+00	.2036+03	.2785+01	.0000+00
VOK	WA22C	WA2C	FJD	FND	SFCD	WFED	VOD	VOKD
.0000+00	.1948+02	.1274+02	.2026+03	.2026+03	.2785+01	.5641+03	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.4507+02	.0000+00	.4521+02	.0000+00	.2772+01	.2105+02	.2544+06	.2545+06	-.1037+03
POX/POUT	FE							
.1033+01	.1265-01							

PN R80411 TEST 004 TD 09-27-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.2000+01	.0000+00	.0000+00	.0000+00	.4680+02	.2500+01	.3170+02	.1453+05	.6660+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.1590+04	.2385+04	.5348+03	.5203+03	.8643+03	.1780+04	.1470+04	.1408+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5203+03		.8629+03	.1003+01	.1002+01	.1003+01	.1002+01	.9993+00	.9915+00
POO	PINS	P2	P2S	P3	P22	P22S	P27	P7
.1832+02	.9471+01	.1468+02	.1342+02	.6995+02	.1457+02	.1366+02	.1845+02	.1863+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1509+02	.1843+02	.1482+02	.1462+02	.1463+02	.8616+03	.1774+04	.1465+04	.1404+04
T27C	T7XC	T22.1X	T22.1XC	PINS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.5884+03	.8603+03	.5287+03	.5271+03	.5169+00	.9910+00	.4764+01	.1266+01	.1268+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1255+01	.1244+01	.1011+01	.9748+02	.3590+02	.6188+02	.6718+02	.3590+02	.3534+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.3534+02	.6252+02	.9761+02	.9761+02	.1724+01	.1086+01	.3598+02	.6251+02	.1467+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.8234+02	.1539+03	.8368+00		.1053+01	.3444+03	.2009+01	.1737+03	.4090+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9614+00	.9870+00	.1451+05	.6650+04	.2182+01	.1589+04	.1262-01	.2342+04	.0000+00
FNC	SFCC	RET	FJ/A9POS	FJS	FR	FNS	SFC	VO
.2342+04	.6784+00	.9954+00	.4387+00	.2340+04	.0000+00	.2340+04	.6794+00	.0000+00
VOK	WA22C	WA2C	FJD	FND	SFCD	WFED	VCD	VDKD
.0000+00	.6243+02	.3594+02	.2343+04	.2343+04	.6794+00	.1592+04	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	AOPLS
.8793+02	.7348+02	.8806+02	.7359+02	.6779+00	.1242+03	.2517+06	.2520+06	-.1686+03
POX/POUT	FE							
.1025+01	.1266-01							

PN RB0411 TEST 004 TD 09-27-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.3000+01	.0000+00	.0000+00	.0000+00	.5160+02	.2500+01	.1000+02	.1509+05	.7287+04

HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.1885+04	.3027+04	.5387+03	.5239+03	.9077+03	.1884+04	.1542+04	.1499+04

T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5239+03		.8913+03	.1010+01	.1005+01	.1010+01	.1005+01	.1002+01	.9922+00

POO	PINS	P2	P2S	P3	P22	P22S	P27	P7
.2019+02	.1043+02	.1472+02	.1324+02	.7932+02	.1458+02	.1345+02	.1949+02	.1980+02

P27S	P9	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1537+02	.1951+02	.1484+02	.1463+02	.1465+02	.8987+03	.1865+04	.1527+04	.1484+04

T27C	T7XC	T22.1X	T22.1XC	PINS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.5968+03	.8824+03	.5329+03	.5275+03	.5166+00	.9918+00	.5389+01	.1337+01	.1345+01

P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAF8M	WA3	WG4
.1325+01	.1314+01	1015+01	.1074+03	.3842+02	.6928+02	.7403+02	.3842+02	.3787+02

WG5	WA27	WG7	W68	WA22/WA2	WAF8M/WA22	WA2C	WA22C	WRT/P3.1
.3787+02	.6997+02	.1076+03	.1076+03	.1803+01	.1069+01	.3854+02	.7017+02	.1418+02

WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH4S/RT4	NF/RT5	DH57/RT5
.8812+02	.1622+03	.8282+00		.1027+01	.3478+03	.2180+01	.1856+03	.4314+01

CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9427+00	.1021+01	.1502+05	.7251+04	.2071+01	.1872+04	.1388-01	.3012+04	.0000+00

FNC	SFCC	REI	FJ/ABPOS	FJS	FR	FNS	SFC	VO
.3012+04	.6217+00	.9890+00	.5646+00	.3017+04	.0000+00	.3017+04	.6248+00	.0000+00

VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.0000+00	.6985+02	.3837+02	.3013+04	.3013+04	.6248+00	.1882+04	.0000+00	.0000+00

NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.9102+02	.8012+02	.9147+07	.8052+02	.6203+00	.1621+03	.2518+06	.2523+06	-.1718+03

POX/POUT	FE
.1026+01	.1402-01

PN REC411 TEST 004 TD C9-27-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.4000+01	.0000+00	.0000+00	.0000+00	.5590+02	.2500+01	.0000+00	.1544+05	.7640+04
HL	WFF	FS	TFF	T2	T3	T4X	T5	T5.1X
.1849+05	.2138+04	.3336+04	.5352+03	.5218+03	.9206+03	.1951+04	.1599+04	.1577+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5218+03		.9137+03	.1006+01	.1003+01	.1006+01	.1003+01	.1006+01	.9964+00
POO	PINS	P2	P2S	P3	P22	P22S	P27	P7
.2136+02	.1104+02	.1478+02	.1318+02	.8513+02	.1464+02	.1339+02	.2032+02	.2057+02
P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1552+02	.2022+02	.1486+02	.1468+02	.1469+02	.9152+03	.1939+04	.1589+04	.1568+04
T27C	T7XC	T22.1X	T22.1XC	PINS/POO	P2/P0S	P3/P2	P27/P22	P7/P2
.5996+03	.9089+03	.5313+03	.5281+03	.5170+00	.9947+00	.5759+01	.1388+01	.1391+01
P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1368+01	.1361+01	.1017+01	.1139+03	.3999+02	.7420+02	.7792+02	.3999+02	.3947+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.3947+02	.7492+02	.1141+03	.1141+03	.1856+01	.1050+01	.3987+02	.7470+02	.1385+02
WR1/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9058+02	.1677+03	.8328+00		.1003+01	.3495+03	.2225+01	.1911+03	.4490+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9427+00	.9937+00	.1539+05	.7617+04	.2021+01	.2119+04	.1519-01	.3315+04	.0000+00
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VD
.3315+04	.6393+00	.9984+00	.6233+00	.3335+04	.0000+00	.3335+04	.6412+00	.0000+00
VDK	WA22D	WA2D	FJD	FND	SFCD	WFED	VDD	VDKD
.0000+00	.7450+02	.3977+02	.3316+04	.3316+04	.6412+00	.2126+04	.0000+00	.0000+00
AECPC	NFCPC	AEPC	NFPC	SFCCGE	M1V1	P1SA1	P0XA1	ADPLS
.9328+02	.8417+02	.9356+02	.8442+02	.6384+00	.1543+03	.2527+06	.2530+06	-.1551+03
P0X/P0UT	FF							
.1029+01	.1528-01							

PN R80411 TEST C04 TD 09-27-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.5000+01	.0000+00	.0000+00	.0000+00	.6020+02	.2500+01	.0000+00	.1568+05	.7920+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.2306+04	.3553+04	.5356+03	.5197+03	.9410+03	.2009+04	.1639+04	.1622+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5197+03		.9230+03	.1002+01	.1001+01	.1002+01	.1001+01	.1008+01	.1000+01
POO	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.2231+02	.1159+02	.1481+02	.1311+02	.9101+02	.1470+02	.1334+02	.2076+02	.2109+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1564+02	.2073+02	.1481+02	.1474+02	.1475+02	.9391+03	.2005+04	.1636+04	.1619+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.6100+03	.9211+03	.5294+03	.5283+03	.5156+00	.9996+00	.6146+01	.1412+01	.1424+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1400+01	.1400+01	.1017+01	.1192+03	.4111+02	.7841+02	.8121+02	.4111+02	.4059+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.4059+02	.7915+02	.1195+03	.1195+03	.1907+01	.1036+01	.4083+02	.7846+02	.1347+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9425+02	.1721+03	.8217+00		.9969+00	.3499+03	.2316+01	.1956+03	.4653+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9432+00	.9986+00	.1566+05	.7912+04	.1980+01	.2286+04	.1600-01	.3646+04	.0000+00
FNC	SFCC	REI	FJ/A3POS	FJS	FR	FNS	SFC	VO
.3646+04	.6271+00	.1005+01	.6889+00	.3674+04	.0000+00	.3674+04	.6278+00	.0000+00
VOK	WA22O	WA2O	FJD	FND	SFCD	WFED	VOD	VOKD
.0000+00	.7841+02	.4081+02	.3647+04	.3647+04	.6278+00	.2289+04	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.9493+02	.8743+02	.9503+02	.8751+02	.6269+00	.1769+03	.2538+06	.2540+06	-.5634+02
POX/POUT	FE							
.1033+01	.1603-01							

PN RP0411 TEST 004 TP 09-27-65

PCINT	ALTC	MACHC	ATMOS	PLP	JNA	IBVP	NF	NF
.6000+01	.0000+00	.0000+00	.0000+00	.7030+02	.2500+01	.0000+00	.1626+05	.8270+04
HL	WFI	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.2640+04	.4040+04	.5360+03	.5219+03	.9730+03	.2130+04	.1739+04	.1716+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5219+03		.9695+03	.1006+01	.1003+01	.1006+01	.1003+01	.9990+00	.9886+00
P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.2292+02	.1184+02	.1463+02	.1276+02	.9834+02	.1453+02	.1307+02	.2130+02	.2189+02
P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1598+02	.2145+02	.1481+02	.1457+02	.1460+02	.9671+03	.2117+04	.1728+04	.1706+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.6175+03	.9636+03	.5328+03	.5295+03	.5166+00	.9913+00	.6700+01	.1466+01	.1491+01
P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1461+01	.1449+01	.1021+01	.1221+03	.4299+02	.7955+02	.8306+02	.4299+02	.4252+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.4252+02	.8032+02	.1225+03	.1225+03	.1850+01	.1044+01	.4317+02	.8071+02	.1325+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NF/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9400+02	.1743+03	.8160+00		.9999+00	.3524+03	.2409+01	.1983+03	.4909+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9380+00	.1001+01	.1621+05	.8245+04	.1967+01	.2635+04	.1744-01	.4060+04	.0000+00
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VU
.4060+04	.6490+00	.9912+00	.7608+00	.4056+04	.0000+00	.4056+04	.6510+00	.0000+00
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VUD	VOKD
.0000+00	.8049+02	.4305+02	.4061+04	.4061+04	.6510+00	.2644+04	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	MIVI	PISAI	POXAI	ADPLS
.9827+02	.9110+02	.9857+02	.9138+02	.6481+00	.2039+03	.2509+06	.2514+06	-.1887+03
POX/POUT	FE							
.1023+01	.1755-01							

PN R80411 TEST 004 TO 05-27-65

PCINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.7000+01	.0000+00	.0000+00	.0000+00	.7410+02	.2500+01	.0000+00	.1650+05	.8400+04

HL	WF	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.2782+04	.4183+04	.5367+03	.5220+03	.9853+03	.2179+04	.1779+04	.1761+04

T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5220+03		.9863+03	.1006+01	.1003+01	.1006+01	.1003+01	.1001+01	.9917+00

POO	PINS	P2	P2S	P3	P22	P22S	P27	P7
.2324+02	.1200+02	.1471+02	.1275+02	.1003+03	.1457+02	.1307+02	.2167+02	.2228+02

P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1614+02	.2184+02	.1483+02	.1460+02	.1463+02	.9790+03	.2165+04	.1768+04	.1750+04

T27C	T7XC	T22.1X	T22.1XC	PINS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.6237+03	.9801+03	.5333+03	.5299+03	.5163+00	.9920+00	.6815+01	.1487+01	.1514+01

P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1484+01	.1473+01	.1020+01	.1239+03	.4348+02	.8077+02	.8446+02	.4348+02	.4303+02

WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.4303+02	.8155+02	.1243+03	.1243+03	.1858+01	.1046+01	.4356+02	.8171+02	.1323+02

WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9428+02	.1752+03	.8036+00		.9950+00	.3535+03	.2445+01	.1992+03	.5023+01

CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9337+00	.9913+00	.1645+05	.8373+04	.1964+01	.2770+04	.1817-01	.4187+04	.0000+00

FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.4187+04	.6615+00	.9932+00	.7851+00	.4192+04	.0000+00	.4192+04	.6636+00	.0000+00

VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.0000+00	.9148+02	.4343+02	.4188+04	.4188+04	.6636+00	.2779+04	.0000+00	.0000+00

NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.9968+02	.9252+02	.9999+02	.9282+02	.6606+00	.1940+03	.2515+06	.2519+06	-.1843+03

POX/POUT	FF
.1025+01	.1829-01

PN R8C411 TEST 004 TD 09-27-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.8000+01	.0000+00	.0000+00	.0000+00	.7520+02	.2500+01	.0000+00	.1657+05	.8430+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.2827+04	.4209+04	.5367+03	.5225+03	.9901+03	.2198+04	.1795+04	.1776+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5225+03		.9869+03	.1007+01	.1004+01	.1007+01	.1004+01	.1008+01	.9993+00
P00	PINS	P2	P2S	P3	P22	P22S	P27	P7
.2361+02	.1221+02	.1481+02	.1285+02	.1013+03	.1468+02	.1314+02	.2187+02	.2245+02
P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1620+07	.2201+02	.1483+02	.1472+02	.1475+02	.9830+03	.2182+04	.1782+04	.1763+04
T27C	T7XC	T22.1X	T22.1XC	PINS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.6226+03	.9798+03	.5337+03	.5299+03	.5173+00	.9989+00	.6843+01	.1489+01	.1516+01
P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1486+01	.1484+01	.1020+01	.1258+03	.4360+02	.8258+02	.8576+02	.4360+02	.4317+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.4317+02	.8337+02	.1262+03	.1262+03	.1894+01	.1038+01	.4342+02	.8294+02	.1316+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9545+02	.1766+03	.7987+00		.9957+00	.3535+03	.2457+01	.1990+03	.5105+01
CD	CF	NEC	NFC	NE/NF	WFEC	FFC	FJC	FRC
.9368+00	.9989+00	.1651+05	.8400+04	.1966+01	.2795+04	.1840-01	.4298+04	.0000+00
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VD
.4298+04	.6503+00	.9987+00	.8116+00	.4332+04	.0000+00	.4332+04	.6527+00	.0000+00
VDK	WA22D	WA2D	FJD	FND	SFCD	WFED	VDD	VDKD
.0000+00	.8267+02	.4328+02	.4299+04	.4299+04	.6527+00	.2806+04	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	P0XA1	ADPLS
.1001+03	.9281+02	.1004+03	.9315+02	.6493+00	.1900+03	.2535+06	.2540+06	-.6732+02
P0X/P0UT	FF							
.1036+01	.1853-01							

PN R80411 TEST 004 TD 09-27-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.9000+01	.0000+00	.0000+00	.0000+00	.5050+02	.2500+01	.1330+02	.1505+05	.7234+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.1873+04	.2956+04	.5402+03	.5273+03	.9032+03	.1874+04	.1539+04	.1512+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5273+03		.8931+03	.1017+01	.1008+01	.1017+01	.1008+01	.9992+00	.9904+00
P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.2013+02	.1041+02	.1468+02	.1325+02	.7945+02	.1455+02	.1344+02	.1939+02	.1969+02
P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1532+02	.1941+02	.1478+02	.1460+02	.1463+02	.8886+03	.1843+04	.1514+04	.1487+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.5924+03	.8786+03	.5361+03	.5274+03	.5172+00	.9934+00	.5411+01	.1332+01	.1341+01
P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1322+01	.1313+01	.1014+01	.1071+03	.3777+02	.6965+02	.7331+02	.3777+02	.3723+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.3723+02	.7033+02	.1073+03	.1073+03	.1844+01	.1053+01	.3811+02	.7091+02	.1389+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.8901+02	.1629+03	.8537+00		.1010+01	.3477+03	.2141+01	.1844+03	.4286+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9470+00	.1015+01	.1493+05	.7175+04	.2080+01	.1860+04	.1394-01	.2994+04	.0000+00
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.2994+04	.6211+00	.9785+00	.5623+00	.2992+04	.0000+00	.2992+04	.6262+00	.0000+00
VOK	WA22C	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.0000+00	.7035+02	.3782+02	.2995+04	.2995+04	.6262+00	.1876+04	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	P0XA1	ADPLS
.9047+02	.7928+02	.9121+02	.7993+02	.6189+00	.1747+03	.2514+06	.2519+06	-.1386+03
P0X/P0UT	FC							
.1025+01	.1417-01							

PN RP0411 TEST 004 TD 09-27-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.1100+02	.7500+04	.9500+00	.0000+00	.7360+02	.2500+01	.0000+00	.1651+05	.8427+04
HL	WFF	FS	TFF	T2	T3	T4X	T5	T5.1X
.1849+05	.3163+04	-.5804+02	.5364+03	.5817+03	.1045+04	.2182+04	.1779+04	.1753+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5817+03		.9827+03	.1122+01	.1059+01	.1122+01	.1059+01	.1349+01	.1335+01
POO	PINS	P2	P2S	P3	P22	P22S	P27	P7
.3210+02	.1659+02	.1983+02	.1754+02	.1205+03	.1962+02	.1755+02	.2742+02	.2740+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1837+02	.2676+02	.1115+02	.1968+02	.1971+02	.9322+03	.1946+04	.1586+04	.1563+04
T27C	T7XC	T22.1X	T22.1XC	PINS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.6012+03	.8762+03	.5312+03	.5272+03	.5170+00	.1778+01	.6078+01	.1397+01	.1382+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1350+01	.2399+01	.1024+01	.1632+03	.5218+02	.1108+03	.1089+03	.5218+02	.5160+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.5160+02	.1118+03	.1630+03	.1630+03	.2124+01	.9822+00	.4095+02	.8790+02	.1361+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.1059+03	.1865+03	.8236+00		.1004+01	.3535+03	.2461+01	.1998+03	.5038+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9047+00	.1015+01	.1559+05	.7957+04	.1959+01	.2214+04	.1545-01	.5930+04	.3848+04
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.2082+04	.1063+01	.1167+01	.1993+01	.8001+04	.5192+04	.2809+04	.1126+01	.1029+04
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.6095+03	.1124+03	.5236+02	.8049+04	.2816+04	.1127+01	.3174+04	.1033+04	.6122+03
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.9449+02	.8793+02	.1001+03	.9312+02	.1037+01	.2621+03	.3388+06	.3394+06	.7797+04
POX/POUT	FE							
.1382+01	.1732-01							

PN RB041L TEST 004 TO 09-27-65

PGINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.1200+02	.7500+04	.9500+00	.0000+00	.6930+02	.2500+01	.0000+00	.1625+05	.8232+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.2923+04	-.3144+03	.5406+03	.5786+03	.1025+04	.2115+04	.1724+04	.1698+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5786+03		.9566+03	.1115+01	.1056+01	.1115+01	.1056+01	.1345+01	.1332+01
POO	PINS	P2	P2S	P3	P22	P22S	P27	P7
.3146+02	.1624+02	.1977+02	.1763+02	.1154+03	.1957+02	.1756+02	.2675+02	.2657+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1775+02	.2592+02	.1118+02	.1963+02	.1966+02	.9190+03	.1896+04	.1546+04	.1523+04
T27C	T7XC	T22.1X	T22.1XC	PINS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.5840+03	.8577+03	.5874+03	.5267+03	.5162+00	.1768+01	.5835+01	.1367+01	.1344+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1311+01	.2319+01	.1025+01	.1605+03	.5071+02	.1095+03	.1075+03	.5071+02	.5010+02
WG5	WA27	WG7	WG9	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.5010+02	.1105+03	.1602+03	.1602+03	.2160+01	.9810+00	.3981+02	.8685+02	.1368+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.1054+03	.1865+03	.8276+00		.1004+01	.3534+03	.2406+01	.1983+03	.4901+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9001+00	.1020+01	.1539+05	.7795+04	.1974+01	.2057+04	.1477-01	.5694+04	.3768+04
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.1926+04	.1068+01	.1171+01	.1903+01	.7660+04	.5069+04	.2591+04	.1128+01	.1022+04
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.6053+03	.1113+03	.5103+02	.7749+04	.2604+04	.1130+01	.2942+04	.1030+04	.6105+03
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	PUXA1	ADPLS
.9325+02	.8613+02	.9848+02	.9096+02	.1043+01	.2451+03	.3380+06	.3386+06	.7730+04
POX/PCUT	FE							
.1379+01	.1643-01							

PN RB0411 TEST 004 TD 09-27-65

PCINT	ALTC	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.1300+02	.7500+04	.9500+00	.0000+00	.6760+02	.2500+01	.0000+00	.1614+05	.8136+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.2805+04	-.4996+03	.5453+03	.5845+03	.1026+04	.2094+04	.1707+04	.1679+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5845+03		.9520+03	.1127+01	.1062+01	.1127+01	.1062+01	.1351+01	.1337+01
P00	PINS	P2	P2S	P3	P22	P22S	P27	P7
.3125+02	.1618+02	.1985+02	.1778+02	.1130+03	.1965+02	.1760+02	.2649+02	.2622+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1750+02	.2562+02	.1122+02	.1970+02	.1974+02	.9103+03	.1858+04	.1515+04	.1490+04
T27C	T7XC	T22.1X	T22.1XC	PINS/P00	P2/POS	P3/P2	P27/P22	P7/P2
.5183+03	.8448+03	.5931+03	.5263+03	.5176+00	.1769+01	.5691+01	.1348+01	.1321+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1291+01	.2283+01	.1024+01	.1585+03	.4984+02	.1084+03	.1079+03	.4984+02	.4922+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.4922+02	.1093+03	.1582+03	.1582+03	.2176+01	.9950+00	.3917+02	.8609+02	.1374+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9975+02	.1961+03	.8306+00		.1006+01	.3526+03	.2392+01	.1969+03	.4837+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.8961+00	.1024+01	.1520+05	.7664+04	.1983+01	.1956+04	.1427-01	.5561+04	.3726+04
FNC	SFCL	REI	FJ/A8POS	FJS	FR	FNS	SFC	VU
.1835+04	.1066+01	.1161+01	.1859+01	.7512+04	.5033+04	.2479+04	.1132+01	.1027+04
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.6085+03	.1098+03	.4995+02	.7567+04	.2481+04	.1133+01	.2811+04	.1036+04	.6136+03
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.9212+02	.8469+02	.9779+02	.8990+02	.1039+01	.2510+03	.3393+06	.3399+06	.7760+04
POX/POUT	FE							
.1384+01	.1608-01							

PN R80411 TEST 004 TC C9-27-65

PCINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.1400+02	.0000+00	.0000+00	.1000+01	.1450+02	.2500+01	.9000+01	.7840+04	.2362+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.5703+03	.2558+03	.5430+03	.5642+03	.6534+03	.1718+04	.1639+04	.1406+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5642+03		.9249+03	.1088+01	.1043+01	.1088+01	.1043+01	.1001+01	.1000+01
POO	PINS	P2	P2S	P3	P22	P22S	P27	P7
.1487+02	.1424+02	.1471+02	.1455+02	.2271+02	.1470+02	.1459+02	.1511+02	.1512+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1471+02	.1508+02	.1473+02	.1470+02	.1470+02	.6007+03	.1579+04	.1507+04	.1292+04
T27C	T7XC	T22.1X	T22.1XC	PINS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.5530+03	.8503+03	.5739+03	.5276+03	.9573+00	.9993+00	.1543+01	.1028+01	.1027+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1025+01	.1024+01	.1002+01	.3144+02	.1285+02	.1859+02	.2240+02	.1285+02	.1265+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.1265+02	.1882+02	.3138+02	.3138+02	.1447+01	.1205+01	.1338+02	.1939+02	.1406+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.3056+02	.6313+02	.8314+00		.1196+01	.1892+03	.5265+00	.5834+02	.4620+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.1047+01	.9677+00	.7517+04	.2265+04	.3319+01	.5460+03	.1166-01	.2598+03	.0000+00
FNC	SFCC	REI	FJ/ABPOS	FJS	FR	FNS	SFC	VO
.2598+03	.2102+01	.9000+00	.4908-01	.2602+03	.0000+00	.2602+03	.2192+01	.0000+00
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.0000+00	.1859+02	.1284+02	.2599+03	.2599+03	.2192+01	.5697+03	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.4556+02	.2502+02	.4752+02	.2610+02	.2063+01	.2306+02	.2531+06	.2531+06	-.2265+02
POX/PCUT	FE							
.1031+01	.1268-01							

PN 880411 TEST 005 TD 09-29-65

POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.1000+01	.3600+05	.9000+00	.0000+00	.7340+02	.2500+01	.0000+00	.1624+05	.8448+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.1200+04	.4637+03	.5382+03	.4548+03	.9182+03	.2139+04	.1741+04	.1736+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.4548+03		.9404+03	.8767+00	.9363+00	.8767+00	.9363+00	.3784+00	.3742+00
POO	PINS	P2	P2S	P3	P22	P22S	P27	P7
.8931+01	.4598+01	.5560+01	.4777+01	.4108+02	.5499+01	.4805+01	.8451+01	.8675+01
P27S	P8	POS	P1S	PGX	T3C	T4XC	T5C	T5.1XC
.5897+01	.8416+01	.3377+01	.5517+01	.5529+01	.1047+04	.2440+04	.1986+04	.1980+04
T27C	T7XC	T22.1X	T22.1XC	PINS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.6487+03	.1073+04	.4667+03	.5324+03	.5148+00	.1646+01	.7389+01	.1537+01	.1560+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1514+01	.2492+01	.1031+01	.4994+02	.1799+02	.3289+02	.3721+02	.1799+02	.1782+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.1782+02	.3321+02	.5091+02	.5091+02	.1828+01	.1131+01	.4452+02	.8229+02	.1290+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9372+02	.1800+03	.7414+00		.9712+00	.3511+03	.2452+01	.2025+03	.5107+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.8706+00	.1022+01	.1734+05	.9022+04	.1922+01	.3386+04	.2173-01	.6600+04	.3543+04
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.3057+04	.1108+01	.4484+00	.2054+01	.2497+04	.1340+04	.1157+04	.1037+01	.8513+03
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.5044+03	.3328+02	.1801+02	.2528+04	.1153+04	.1041+01	.1201+04	.8723+03	.5168+03
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.1051+03	.9969+02	.9841+02	.9335+02	.1140+01	.7220+02	.9500+05	.9521+05	.1961+04
POX/POUT	FE							
.3903+00	.1906-01							

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POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.2000+01	.3600+05	.9000+00	.0000+00	.7340+02	.2500+01	.0000+00	.1621+05	.8435+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.1193+04	.4715+03	.5378+03	.4510+03	.9120+03	.2131+04	.1735+04	.1726+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.4510+03		.9335+03	.8696+00	.9325+00	.8696+00	.9325+00	.3786+00	.3745+00
POO	P1NS	P2	P2S	P3	P22	P22S	P2/	P7
.8907+01	.4573+01	.5563+01	.4788+01	.4106+02	.5504+01	.4811+01	.8446+01	.8675+01
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.5900+01	.8422+01	.3377+01	.5525+01	.5539+01	.1049+04	.2451+04	.1995+04	.1984+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.6632+03	.1074+04	.4629+03	.5324+03	.5134+00	.1647+01	.7381+01	.1534+01	.1559+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1514+01	.2494+01	.1030+01	.5001+02	.1800+02	.3295+02	.3736+02	.1800+02	.1783+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.1783+02	.3328+02	.5098+02	.5098+02	.1831+01	.1134+01	.4433+02	.8204+02	.1287+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9462+02	.1796+03	.7390+00		.9746+00	.3512+03	.2444+01	.2025+03	.5116+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.8666+00	.1041+01	.1739+05	.9046+04	.1922+01	.3379+04	.2178-01	.6697+04	.3533+04
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.3163+04	.1068+01	.4535+00	.2086+01	.2535+04	.1338+04	.1190+04	.9960+00	.8483+03
VOK	WA22O	WA2O	FJD	FNO	SFCO	WFEO	VOO	VOKO
.5026+03	.3332+02	.1800+02	.2564+04	.1194+04	.9992+00	.1193+04	.8687+03	.5147+03
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.1054+03	.9995+02	.9826+02	.9320+02	.1101+01	.9355+02	.9513+05	.9538+05	.1970+04
POX/POUT	FE							
.3910+00	.1894-01							

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PCINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NL	NF
.3000+01	.3600+05	.9000+00	.0000+00	.6960+02	.2500+01	.0000+00	.1599+05	.8325+04

HL	WEE	ES	TEE	T2	T3	T4X	T5	T5.1X
.1849+05	.1148+04	.4323+03	.5363+03	.4488+03	.8979+03	.2079+04	.1691+04	.1686+04

T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.4488+03		.9121+03	.8653+00	.9302+00	.8653+00	.9302+00	.3769+00	.3729+00

P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.8919+01	.4598+01	.5538+01	.4772+01	.4043+02	.5479+01	.4793+01	.8406+01	.8567+01

P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.5825+01	.8324+01	.3377+01	.5499+01	.5512+01	.1038+04	.2402+04	.1954+04	.1948+04

T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.6649+03	.1054+04	.4602+03	.5318+03	.5155+00	.1640+01	.7300+01	.1534+01	.1547+01

P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1503+01	.2465+01	.1029+01	.5022+02	.1791+02	.3325+02	.3720+02	.1791+02	.1773+02

WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.1773+02	.3357+02	.5118+02	.5118+02	.1856+01	.1119+01	.4422+02	.8295+02	.1291+02

WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9580+02	.1804+03	.7500+00		.9712+00	.3506+03	.2410+01	.2024+03	.5012+01

CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.8650+00	.1022+01	.1719+05	.8950+04	.1920+01	.3274+04	.2116-01	.6506+04	.3540+04

FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.2966+04	.1104+01	.4544+00	.2017+01	.2452+04	.1334+04	.1118+04	.1027+01	.8426+03

VOK	WA22C	WA2C	FJD	FND	SFCD	WFED	VOD	VOKD
.4992+03	.3377+02	.1800+02	.2497+04	.1118+04	.1032+01	.1153+04	.8666+03	.5134+03

NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	P0XA1	ADPLS
.1042+03	.9889+02	.9688+02	.9199+02	.1139+01	.7425+02	.9470+05	.9492+05	.1946+04

P0X/P0UT	EE
.3890+00	.1831-01

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POINT	ALTC	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.4000+01	.3600+05	.9000+00	.0000+00	.1460+02	.2500+01	.9250+02	.1059+05	.4367+04

HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.2841+03	-.1284+04	.5289+03	.4526+03	.6084+03	.1033+04	.8814+03	.9202+03

T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.4526+03		.5987+03	.8726+00	.9341+00	.8726+00	.9341+00	.3779+00	.3758+00

P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.6092+01	.4486+01	.5554+01	.5365+01	.1251+02	.5522+01	.5175+01	.5304+01	.4719+01

P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.3246+01	.4751+01	.3388+01	.5538+01	.5545+01	.6972+03	.1184+04	.1010+04	.1054+04

T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.5480+03	.6861+03	.4558+03	.5224+03	.7365+00	.1639+01	.2252+01	.9605+00	.8497+00

P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.8554+00	.1402+01	.9933+00	.3035+02	.9429+01	.2175+02	.2744+02	.9429+01	.9244+01

WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.9244+01	.2192+02	.3110+02	.3110+02	.2307+01	.1261+01	.2331+02	.5407+02	.1807+02

WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9039+02	.1613+03	.7570+00		.6679+00	.3295+03	.1183+01	.1471+03	.2339+01

CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.7844+00	.9586+00	.1134+05	.4675+04	.2425+01	.8047+03	.9868-02	.1904+04	.2161+04

FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VG
-.2570+03	-.3131+01	.4507+00	.5900+00	.7196+03	.8168+03	-.9713+02	-.2925+01	.8458+03

VGK	WA22D	WA2D	FJD	FND	SFCD	WFED	VGD	VGKD
.5012+03	.0000+00	.0000+00	.0000+00	.0000+00	.0000+00	.0000+00	.0000+00	.0000+00

NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	P0XA1	ADPLS
.6871+02	.5166+02	.6418+02	.4825+02	-.3226+01	.3775+02	.9537+05	.9549+05	.1966+04

P0X/P0UT	FE
.3913+00	.8611-02

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PCINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.1000+01	.0000+00	.0000+00	.1000+01	.1460+02	.2500+01	.9810+02	.7786+04	.2322+04
HL	WFF	FS	TFF	T2	T3	T4X	T5	T5.1X
.1849+05	.5482+03	.2363+03	.5340+03	.5682+03	.6594+03	.1740+04	.1660+04	.1414+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5682+03	.5893+03	.9135+03	.1095+01	.1047+01	.1095+01	.1047+01	.1004+01	.1003+01
POO	PINS	P2	P2S	P3	P22	P22S	P27	P7
.1498+02	.1436+02	.1475+02	.1460+02	.2252+02	.1474+02		.1517+02	.1513+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1474+02	.1510+02	.1486+02	.1474+02	.1474+02	.6020+03	.1589+04	.1516+04	.1291+04
T27C	T7XC	T22.1X	T22.1XC	PINS/POO	P2/POS	P3/P2	P27/P22	P7/P2
.5380+03	.8340+03	.5771+03	.5269+03	.9580+00	.9923+00	.1527+01	.1029+01	.1026+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1024+01	.1016+01	.1001+01	.3141+02	.1221+02	.1918+02		.1221+02	.1202+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.1202+02	.1940+02	.3133+02	.3133+02	.1570+01		.1274+02	.2001+02	.1354+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.3105+02	.6261+02	.7971+00	.3905+00	.1203+01	.1866+03	.5351+00	.5699+02	.4803+01
CO	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.1260+01	.6610+00	.7439+04	.2219+04	.3353+01	.5219+03	.1171-01	.1441+03	.0000+00
FNC	SFCC	REI	FJ/A0PDS	FJS	FR	FNS	SFC	VO
.1441+03	.3621+01	.8941+00	.2703-01	.1446+03	.0000+00	.1446+03	.3790+01	.0000+00
VCK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.0000+00	.1913+02	.1217+02	.1442+03	.1442+03	.3790+01	.5464+03	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.4505+02	.2452+02	.4719+02	.2566+02	.3550+01	.1654+02	.2539+06	.2539+06	-.1082+03
POX/PCUT	FE							
.1024+01	.1283-01							

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POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.2000+01	.0000+00	.0000+00	.1000+01	.6070+02	.2500+01	.3500+01	.1566+05	.7543+04

HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.2004+04	.3002+04	.5347+03	.5621+03	.9834+03	.2036+04	.1666+04	.1639+04

T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5621+03	.6419+03	.9557+03	.1084+01	.1041+01	.1084+01	.1041+01	.1007+01	.9982+00

P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.2050+02	.1061+02	.1479+02	.1338+02	.8046+02	.1467+02		.1961+02	.1972+02

P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1533+02	.1955+02	.1486+02	.1472+02	.1473+02	.9074+03	.1879+04	.1537+04	.1512+04

T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.5923+03	.8819+03	.5718+03	.5276+03	.5177+00	.9953+00	.5439+01	.1337+01	.1333+01

P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1321+01	.1315+01	.1009+01	.1058+03	.3649+02	.6956+02		.3649+02	.3602+02

WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.3602+02	.7022+02	.1060+03	.1060+03	.1906+01		.3773+02	.7255+02	.1382+02

WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9072+02	.1662+03	.8115+00	.7025+00	.1009+01	.3469+03	.2309+01	.1848+03	.4592+01

CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9650+00	.1000+01	.1504+05	.7246+04	.2076+01	.1912+04	-.1448-01	.3004+04	.0000+00

FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VD
.3004+04	.6367+00	.9090+00	.5652+00	.3024+04	.0000+00	.3024+04	.6628+00	.0000+00

VDK	WA22D	WA2D	FJD	FND	SFCD	WFED	VDD	VDKD
.0000+00	.6971+02	.3626+02	.3005+04	.3005+04	.6628+00	.1992+04	.0000+00	.0000+00

NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	P0XA1	ADPLS
.9115+02	.8006+02	.9488+02	.8335+02	.6256+00	.1398+03	.2535+06	.2537+06	-.1178+03

P0X/P0UT	FE
.1034+01	.1570-01

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POINT	ALTO	MACHO	ATMOS	PLP	JNA	IPVP	NE	NF
.3000+01	.0000+00	.0000+00	.1000+01	.6500+02	.2500+01	.0000+00	.1595+05	.7821+04
HL	WFF	FS	TFF	T2	T3	T4X	T5	T5.1X
.1849+05	.2179+04	.3286+04	.5359+03	.5622+03	.9998+03	.2099+04	.1717+04	.1682+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5622+03	.6490+03	.7778+03	.1084+01	.1041+01	.1084+01	.1041+01	.1005+01	.9964+00
P00	P1NS	P2	P25	P3	P22	P22S	P27	P7
.2106+02	.1082+02	.1477+02	.1322+02	.8512+02	.1464+02		.2003+02	.2026+02
P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1550+02	.2005+02	.1491+02	.1469+02	.1471+02	.9224+03	.1937+04	.1584+04	.1552+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P7/P0S	P3/P2	P27/P22	P7/P2
.5988+03	.9021+03	.6724+03	.5291+03	.5135+00	.9908+00	.5762+01	.1368+01	.1371+01
P8/P2	P8/P0S	P7/P0	WA1N	WA2	WA22	WAF8M	WA3	WG4
.1357+01	.1344+01	.1011+01	.1087+03	.3798+02	.7097+02		.3798+02	.3752+02
WG5	WA27	WG7	W68	WA22/WA2	WAF8M/WA22	WA2C	WA22C	WRT/P3.1
.3752+02	.7165+02	.1089+03	.1089+03	.1869+01		.3933+02	.7415+02	.1371+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.9114+02	.1681+03	.8142+00	.6973+00	.1015+01	.3480+03	.2363+01	.1887+03	.4734+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9560+00	.9914+00	.1532+05	.7512+04	.2039+01	.2081+04	.1512-01	.3214+04	.0000+00
FNC	SFCC	REI	FJ/ABPOS	FJS	FR	FNS	SFC	VO
.3214+04	.6476+00	.9076+00	.6020+00	.3231+04	.0000+00	.3231+04	.6742+00	.0000+00
VOK	WA22O	WA2O	FJD	FND	SFCD	WFED	VOD	VOKD
.0000+00	.7125+02	.3779+02	.3215+04	.3215+04	.6742+00	.2168+04	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.9282+02	.8301+02	.9664+02	.8642+02	.6363+00	.1314+03	.2530+06	.2532+06	-.1859+03
POX/POUT	FE							
.1032+01	.1639-01							

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POINT	ALTC	MACHC	ATMOS	PLP	JNA	IBVP	NE	NF
.4000+01	.7500+04	.1000+01	-.1000+01	.1570+02	.2500+01	.9820+02	.1041+05	.4287+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.4014+03	-.5755+04	.5409+03	.5335+03	.6692+03	.9588+03	.8238+03	.8112+03
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5335+03	.5476+03	.6081+03	.1029+01	.1014+01	.1029+01	.1014+01	.1423+01	.1414+01
POD	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.2301+02	.1516+02	.2091+02	.2032+02	.3804+02	.2078+02		.1890+02	.1546+02
P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1112+02	.1669+02	.1121+02	.2083+02	.2084+02	.6506+03	.9322+03	.8010+03	.7887+03
T27C	T7XC	T22.1X	T22.1XC	P1NS/P0D	P2/P0S	P3/P2	P27/P22	P7/P2
.5324+03	.5913+03	.5349+03	.5200+03	.6591+00	.1864+01	.1819+01	.9095+00	.7396+00
P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.7983+00	.1488+01	.9264+00	.1157+03	.2995+02	.8516+02		.2995+02	.2922+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.2922+02	.8570+02	.1147+03	.1147+03	.2843+01		.2135+02	.6106+02	.1980+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.1061+03	.1829+03	.7297+00	-.1126+01	.1014+01	.3362+03	.1081+01	.1494+03	.1833+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.7866+00	.1040+01	.1026+05	.4227+04	.2428+01	.2782+03	.3724-02	.2190+04	.2561+04
FNC	SFCC	REI	FJ/A8P0S	FJS	FR	FNS	SFC	VC
-.3706+03		.1373+01	.7720+00	.3117+04	.3644+04	-.5273+03		.1022+04
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VCC	VOKD
.6053+03	.0000+00	.0000+00	.0000+00	.0000+00		.0000+00	.0000+00	.0000+00
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	P0XA1	ADPLS
.6221+02	.4671+02	.6309+02	.4737+02		.1037+03	.3587+06	.3588+06	.8767+04
P0X/P0UT	FE							
.1463+01	.3830-02							

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POINT	ALTD	MACHD	ATMOS	PLP	JNA	IRVP	NE	NF
.5000+01	.7500+04	.1000+01	-.1000+01	.7030+02	.2500+01	.0000+00	.1625+05	.0000+00
HL	WFP	FS	TFP	T2	T3	T4X	T5	T5.1X
.1849+05	.3509+04	.6864+02	.5378+03	.5361+03	.9896+03	.2107+04	.1712+04	.1684+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5361+03	.6292+03	.9391+03	.1034+01	.1017+01	.1034+01	.1017+01	.1426+01	.1411+01
P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.3440+02	.1780+02	.2096+02	.1835+02	.1348+03	.2074+02		.2977+02	.2969+02
P27S	P9	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.2007+02	.2921+02	.1119+02	.2079+02	.2082+02	.9574+03	.2039+04	.1656+04	.1629+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.6087+03	.9086+03	.5456+03	.5278+03	.5174+00	.1874+01	.6430+01	.1436+01	.1417+01
P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1394+01	.2611+01	.1017+01	.1808+03	.5938+02	.1212+03		.5938+02	.5869+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.5869+02	.1222+03	.1805+03	.1805+03	.2041+01		.4233+02	.8730+02	.1347+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.1030+03	.1863+03	.8103+00	.7091+00	.1002+01	.3540+03	.2439+01	.0000+00	.4947+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.8883+00	.1033+01	.1598+05	.0000+00	.0000+00	.2420+04	.1634-01	.6391+04	.4029+04
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.2362+04	.1024+01	.1367+01	.2264+01	.9116+04	.5746+04	.3369+04	.1041+01	.1028+04
VOK	WA22C	WA2D	FJ.	FND	SFCD	WFED	VOD	VOKD
.6091+03	.1231+03	.5969+02	.9201+04	.3382+04	.1043+01	.3527+04	.1036+04	.6136+03
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.9688+02	.0000+00	.9849+02	.0000+00	.1017+01	.2690+03	.3580+06	.3585+06	.8778+04
POX/POUT	FC							
.1462+01	.1689-01							

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PCINT	ALTD	MACHC	ATMOS	PLP	JNA	IBVP	NE	NF
.6000+01	.7500+04	.1000+01	-.1000+01	.7030+02	.2500+01	.0000+00	.1628+05	.8367+04

HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.3461+04	-.1158+03	.5386+03	.5467+03	.1001+04	.2117+04	.1721+04	.1694+04

T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5467+03	.6374+03	.9446+03	.1054+01	.1027+01	.1054+01	.1027+01	.1435+01	.1420+01

P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.3450+02	.1785+02	.2108+02	.1052+02	.1334+03	.2087+02		.2961+02	.2958+02

P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.2000+02	.2910+02	.1116+02	.2091+02	.2093+02	.9499+03	.2009+04	.1633+04	.1607+04

T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/POS	P3/P2	P27/P22	P7/P2
.6047+03	.8962+03	.5562+03	.5277+03	.5175+00	.1890+01	.6325+01	.1419+01	.1403+01

P8/P2	P8/POS	P7/P2	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1380+01	.2608+01	.1016+01	.1805+03	.5856+02	.1217+03		.5856+02	.5788+02

WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.5788+02	.1227+03	.1802+03	.1802+03	.2078+01		.4190+02	.8797+02	.1350+02

WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.1046+03	.1872+03	.8144+00	.7184+00	.1002+01	.3537+03	.2441+01	.2017+03	.4962+01

CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.8935+00	.1030+01	.1585+05	.8150+04	.1945+01	.2350+04	.1603-01	.6341+04	.4062+04

FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SEC	VO
.2280+04	.1031+01	.1342+01	.2265+01	.9098+04	.5828+04	.3271+04	.1058+01	.1044+04

VOK	WA22C	WA2C	FJD	FND	SFCD	WFED	VOD	VOKD
.6188+03	.1229+03	.5851+02	.9098+04	.3268+04	.1058+01	.3459+04	.1046+04	.6196+03

NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	PUXA1	ADPLS
.9608+02	.9005+02	.9864+02	.9245+02	.1019+01	.3064+03	.3601+06	.3605+06	.8908+04

POX/PCUT	FE
.1472+01	.1689-01

PN RE041I TEST 6 TO 10-04-65

POINT	ALTC	MACHC	ATMOS	PLP	JNA	IBVP	NE	NF
.7000+01	.7500+04	.1000+01	-.1000+01	.6550+02	.2500+01	.0000+00	.1599+05	.8204+04
HL	WFP	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.3292+04	-.2595+03	.5394+03	.5365+03	.9754+03	.2048+04	.1663+04	.1641+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.5365+03	.6223+03	.9184+03	.1034+01	.1017+01	.1034+01	.1017+01	.1432+01	.1418+01
P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.3411+02	.1765+02	.2105+02	.1857+02	.1301+03	.2084+02		.2926+02	.2907+02
P27S	PF	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1963+02	.2862+02	.1131+02	.2090+02	.2091+02	.9430+03	.1980+04	.1608+04	.1586+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.6016+03	.8879+03	.5454+03	.5273+03	.5174+00	.1861+01	.6181+01	.1404+01	.1381+01
P3/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1360+01	.2530+01	.1016+01	.1795+03	.5818+02	.1210+03		.5818+02	.5747+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.5747+02	.1220+03	.1791+03	.1791+03	.2079+01		.4131+02	.8676+02	.1358+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.1040+03	.1867+03	.8157+00	.7212+00	.9982+00	.3534+03	.2395+01	.2012+03	.4810+01
CD	CF	NFC	NFC	NE/NF	WFEC	FCC	FJC	FRC
.8844+00	.1029+01	.1572+05	.8067+04	.1949+01	.2260+04	.1563-01	.6126+04	.3962+04
FNC	SFCC	REI	FJ/A8P0S	FJS	FR	FNS	SFC	VC
.2164+04	.1045+01	.1372+01	.2155+01	.8774+04	.5675+04	.3099+04	.1062+01	.1023+04
VCK	WA22C	WA2C	FJD	FND	SFCD	WFED	VDD	VDKD
.6062+03	.1223+03	.5824+02	.8846+04	.3094+04	.1063+01	.3296+04	.1036+04	.6138+03
NECPC	NFCPC	NEPC	NFPC	SFCCGF	M1V1	P1SA1	PCXA1	ADPLS
.9529+02	.8913+02	.9691+02	.9065+02	.1037+01	.2829+03	.3598+06	.3601+06	.8751+04
POX/POUT	FC							
.1471+01	.1617-01							

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POINT	ALTC	MACHC	ATMOS	PLP	JNA	IBVP	NE	NF
.8000+01	.7500+04	.1000+01	.1000+01	.1570+02	.2500+01	.9800+02	.1099+05	.4510+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.3810+03	-.5680+04	.5436+03	.6344+03	.7810+03	.1093+04	.9480+03	.9295+03
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.6344+03	.6363+03	.7093+03	.1223+01	.1106+01	.1223+01	.1106+01	.1428+01	.1419+01
P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.2309+02	.1541+02	.2098+02	.2044+02	.3568+02	.2086+02		.1871+02	.1534+02
P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1109+02	.1651+02	.1115+02	.2090+02	.2091+02	.6385+03	.8936+03	.7751+03	.7599+03
T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.5202+03	.5799+03	.6360+03	.5199+03	.6675+00	.1881+01	.1700+01	.8973+00	.7309+00
P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.7867+00	.1480+01	.9291+00	.1089+03	.2641+02	.8188+02		.2641+02	.2578+02
WG5	WA27	WG7	WG8	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.2578+02	.8236+02	.1079+03	.1079+03	.3100+01		.2046+02	.6380+02	.2011+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.1110+03	.1875+03	.7023+00	-.5411+02	.1031+01	.3325+03	.1102+01	.1465+03	.1911+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.8582+00	.1084+01	.9939+04	.4078+04	.2437+01	.2413+03	.3370-02	.2337+04	.2636+04
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VD
-.2988+03		.1108+01	.8310+00	.3337+04	.3763+04	-.4267+03		.1121+04
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VDD	VOKD
.6645+03	.8272+02	.2652+02	.3351+04	-.4284+03		.3826+03	.1121+04	.6645+03
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	P0XA1	ADPLS
.6024+02	.4506+02	.6662+02	.4983+02		.1263+03	.3600+06	.3601+06	.8890+04
P0X/P0UT	FE							
.1471+01	.4122-02							

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POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.9000+01	.7500+04	.1000+01	.1000+01	.7730+02	.2500+01	.0000+00	.1654+05	.8189+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.2815+04	-.1340+04	.5398+03	.6327+03	.1091+04	.2177+04	.1776+04	.1743+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.6327+03	.7099+03	.9991+03	.1220+01	.1104+01	.1220+01	.1104+01	.1426+01	.1412+01
P00	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.3220+02	.1669+02	.2095+02	.1895+02	.1115+03	.2075+02		.2711+02	.2622+02
P27S	P8	P0S	P1S	P0X	T3C	T4XC	T5C	T5.1XC
.1776+02	.2599+02	.1112+02	.2083+02	.2084+02	.8944+03	.1785+04	.1456+04	.1429+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/P00	P2/P0S	P3/P2	P27/P22	P7/P2
.5821+03	.8192+03	.6412+03	.5257+03	.5183+00	.1885+01	.5324+01	.1306+01	.1252+01
P8/P2	P8/P0S	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1241+01	.2338+01	.1009+01	.1580+03	.4873+02	.1089+03		.4873+02	.4815+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.4815+02	.1098+03	.1576+03	.1576+03	.2235+01		.3774+02	.8517+02	.1402+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.1079+03	.1899+03	.8210+00	.7330+00	.1008+01	.3544+03	.2447+01	.1943+03	.4917+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.9107+00	.1026+01	.1497+05	.7415+04	.2019+01	.1788+04	.1353-01	.5469+04	.3839+04
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.1630+04	.1096+01	.1111+01	.1949+01	.7799+04	.5474+04	.2325+04	.1211+01	.1121+04
VOK	WA2D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.6645+03	.1106+03	.4900+02	.7858+04	.2337+04	.1211+01	.2830+04	.1125+04	.6665+03
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.9075+02	.8193+02	.1002+03	.9049+02	.1050+01	.2816+03	.3586+06	.3588+06	.8857+04
POX/POUT	FE							
.1466+01	.1651-01							

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POINT	ALTD	MACHD	ATMOS	PLP	JNA	IBVP	NE	NF
.1000+02	.7500+04	.1000+01	.1000+01	.6820+02	.2500+01	.3500+02	.1606+05	.7685+04
HL	WFE	FS	TFE	T2	T3	T4X	T5	T5.1X
.1849+05	.2312+04	-.2093+04	.5425+03	.6353+03	.1048+04	.2029+04	.1663+04	.1600+04
T22	T27	T7X	THETA2	RTHETA2	THETA22	RTHETA22	DELTA2	DELTA22
.6353+03	.6971+03	.9552+03	.1225+01	.1107+01	.1225+01	.1107+01	.1428+01	.1413+01
POD	P1NS	P2	P2S	P3	P22	P22S	P27	P7
.3062+02	.1586+02	.2098+02	.1915+02	.9842+02	.2076+02		.2546+02	.2413+02
P27S	P8	POS	P1S	POX	T3C	T4XC	T5C	T5.1XC
.1635+02	.2410+02	.1110+02	.2086+02	.2088+02	.8554+03	.1657+04	.1358+04	.1306+04
T27C	T7XC	T22.1X	T22.1XC	P1NS/POD	P2/POS	P3/P2	P27/P22	P7/P2
.5691+03	.7799+03	.6427+03	.5248+03	.5179+00	.1889+01	.4691+01	.1226+01	.1150+01
P8/P2	P8/POS	P7/P8	WA1N	WA2	WA22	WAFBM	WA3	WG4
.1149+01	.2170+01	.1001+01	.1496+03	.4672+02	.1025+03		.4672+02	.4606+02
WG5	WA27	WG7	W68	WA22/WA2	WAFBM/WA22	WA2C	WA22C	WRT/P3.1
.4606+02	.1034+03	.1491+03	.1491+03	.2194+01		.3622+02	.8031+02	.1494+02
WRT/P27	WRT/P7	EFFCOMP	EFFFAN	EFFBURN	NE/RT4	DH45/RT4	NF/RT5	DH57/RT5
.1072+03	.1910+03	.9331+00	.7034+00	.1045+01	.3565+03	.2282+01	.1885+03	.4570+01
CD	CF	NEC	NFC	NE/NF	WFEC	FEC	FJC	FRC
.8995+00	.1049+01	.1451+05	.6944+04	.2090+01	.1463+04	.1155-01	.4957+04	.3644+04
FNC	SFCC	REI	FJ/A8POS	FJS	FR	FNS	SFC	VO
.1314+04	.1114+01	.1106+01	.1771+01	.7078+04	.5202+04	.1875+04	.1233+01	.1126+04
VOK	WA22D	WA2D	FJD	FND	SFCD	WFED	VOD	VOKD
.6670+03	.1040+03	.4692+02	.7107+04	.1883+04	.1233+01	.2322+04	.1126+04	.6670+03
NECPC	NFCPC	NEPC	NFPC	SFCCGE	M1V1	P1SA1	POXA1	ADPLS
.8794+02	.7673+02	.9732+02	.8492+02	.1066+01	.2671+03	.3592+06	.3595+06	.8904+04
POX/POUT	FE							
.1468+01	.1414-01							

APPENDIX II
METHODS OF CALCULATION

General methods and equations employed to compute the steady-state and transient parameters presented are given below. Where applicable, arithmetic averages of the pressures and indicated temperatures were used.

SPECIFIC HEATS

The specific heat at constant pressure was computed from the empirical equation

$$c_p = \frac{(a_1 + b_1T + c_1T^2) + f_e(a_2 + b_2T + c_2T^2)}{1 + f_e}$$

where a_1, b_1, and c_1 are constants based on the specific heats of the constituents of air, and a_2, b_2, and c_2 are constants based on a fuel hydrogen-carbon ratio of 0.16 and the specific heats of water vapor, oxygen, and carbon dioxide. The constants to be used for the two temperature ranges are shown below:

Temperature Range, °R	a_1	b_1	c_1	a_2	b_2	c_2
400 – 1700	0.2318	0.104 x 10^{-4}	0.7166 x 10^{-8}	0.2655	3.7265 x 10^{-4}	−6.6353 x 10^{-8}
1701 – 4500	0.2214	0.3521 x 10^{-4}	−0.3776 x 10^{-8}	0.3397	2.7182 x 10^{-4}	−2.9044 x 10^{-8}

RATIO OF SPECIFIC HEATS

The ratio of specific heats was assumed to be 1.4 at stations 1n and 2 and was calculated for all other stations from the expression:

$$\gamma = \frac{c_p}{c_p - \frac{R}{J}}$$

TOTAL TEMPERATURE

Total temperatures except at station 5 were obtained by applying a recovery factor of 0.85 (a function of probe geometry) to the indicated temperature in the following relationship:

$$T = \frac{T_i \left(\frac{P}{\bar{P}}\right)^{\frac{\gamma-1}{\gamma}}}{1 + RF\left[\left(\frac{P}{\bar{P}}\right)^{\frac{\gamma-1}{\gamma}} - 1\right]}$$

The measured value of temperature at station 5 was used.

AIRFLOW

Airflow at station 1n (venturi throat) was calculated from the following equation:

$$W_{a_{1n}} = \frac{P_{1n} A_{1n} C_{f_{1n}}}{\left(\frac{P_{1n}}{P_{00}}\right)^{\frac{\gamma-1}{\gamma}}} \sqrt{\frac{2\gamma g}{RT_i (\gamma - 1)}\left[1 - \left(\frac{P_{1n}}{P_{00}}\right)^{\frac{\gamma-1}{\gamma}}\right]}$$

and

$$C_{f_{1n}} = 0.9863 \quad \text{(venturi choked)}$$

$$C_{f_{1n}} = 1.1384 - 0.3579\left(\frac{P_{1n}}{P_{00}}\right) + 0.1592\left(\frac{P_{1n}}{P_{00}}\right)^2 \quad \text{(venturi unchoked)}$$

where $C_{f_{1n}}$ is an empirically determined flow coefficient based on the venturi wall curvature, boundary-layer development, and venturi area ratio.

Airflow at station 2 (compressor inlet) was calculated from the following equation:

$$W_{a_2} = \frac{P_2 A_2 C_{f_2}}{\left(\frac{P_2}{P_2}\right)^{\frac{\gamma-1}{\gamma}}} \sqrt{\frac{2\gamma g}{RT_2 (\gamma - 1)}\left[1 - \left(\frac{P_2}{P_2}\right)^{\frac{\gamma-1}{\gamma}}\right]}$$

and

$$C_{f_2} = 0.98 \quad \text{(constant obtained from Ref. 5)}$$

Airflow at station 22 (fan inlet) was obtained by the following relationship:

$$W_{a_{22}} = W_{a_{in}} - 0.988\ W_{a_2} - W_{leak}$$

where W_{leak}, the leakage rate into or out of the test cell, was determined experimentally as a function of the ratio of cell pressure to pressure outside the cell.

Air or gas flows at the other stations were obtained by adding or subtracting from the compressor inlet and fan inlet airflows as follows:

$$W_{a_3} = W_{a_2}$$

$$W_{g_4} = W_{a_2} - 0.028\ W_{a_2} + W_{f_c}$$

(Constants were supplied by the General Electric Company.)

$$W_{g_5} = W_{g_4}$$

$$W_{a_{27}} = W_{a_{22}} + 0.018\ W_{a_2}$$

$$W_{g_7} = W_{g_5} - 0.007\ W_{a_2} + W_{a_{27}}$$

$$W_{g_8} = W_{g_7}$$

VELOCITY

Velocity was determined from the expression:

$$V = \sqrt{\frac{2\gamma g R T}{\gamma - 1}\left[1 - \left(\frac{p}{P}\right)^{\frac{\gamma - 1}{\gamma}}\right]}$$

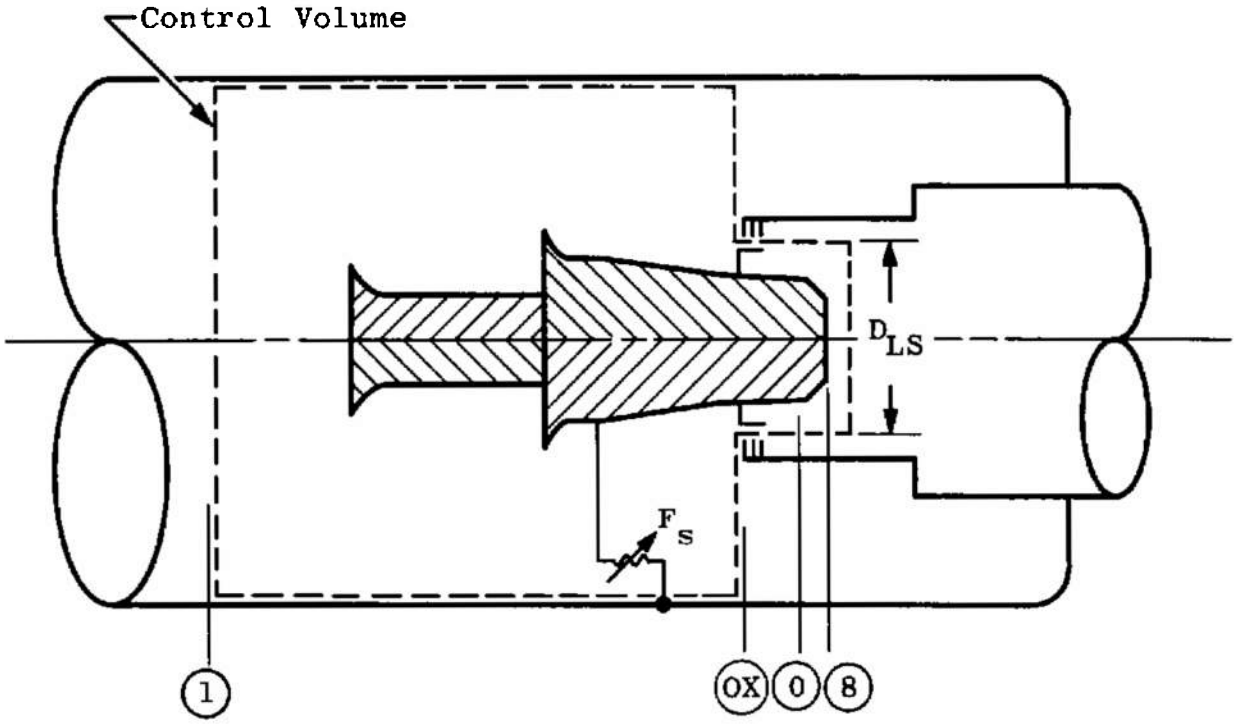
To obtain V in knots, a value of 0.5925 knot/ft/sec was used.

THRUST

Jet Thrust

The equation for jet thrust was determined by: (1) summing the forces on the control volume in the sketch below, (2) determining the change in

momentum of the gases crossing the boundary of the control volume, (3) setting the sum of forces equal to the change in momentum, (4) defining "jet thrust" (F_{j_s}) and substituting F_{j_s} for the terms which make up its definition, and (5) solving for F_{j_s} as follows:



Sum of Momentum Terms = Sum of Forces on Control Volume

$$m_8V_8 - m_1V_1 = p_1A_1 + F_S - \left[p_{OX}\ (A_1 - A_{LS}) + p_0\ (A_{LS} - A_8) + p_8A_8\right]$$

$$F_{J_8} = m_8V_8 + A_8\ (p_8 - p_0)$$

$$F_{j_8} = m_1V_1 + F_S + p_1A_1 - p_{OX}\ (A_1 - A_{LS}) - p_0A_{LS}$$

$$F_{J_8} = m_1V_1 + F_S + A_1\ (p_1 - p_{OX}) + A_{LS}\ (p_{OX} - p_0)$$

Since $p_1 = p_{OX}$

$$F_{J_8} = m_1V_1 + F_S + A_{LS}\ (p_{OX} - p_0)$$

One-dimensional flow was assumed to exist at station 1 for the calculation of the low velocity (51 ft/sec at sea-level static, maximum

power) at that station. It should be noted that the engine and fan bellmouths were mounted directly on the engine (Fig. 1b), and that the small thrust produced by the bellmouths is included in the jet thrust.

Net Thrust

Net thrust was calculated by use of the following equation:

$$F_{n_s} = F_{J_s} - \frac{(W_{a_{in}} - W_{leak})}{g} V_\infty$$

Inlet and Test Cell Ambient Pressure Correction

Since the test cell pressure could not always be maintained at the desired altitude pressure, it is necessary to apply a correction to the measured values of jet and net thrust. This correction was applied only to data obtained at operating conditions which satisfied the following:

1. The actual exhaust nozzle pressure ratio (P_8/p_0) was greater than the critical pressure ratio
2. The desired exhaust nozzle pressure ratio ($P_8/p_{0_{adj}}$) was greater than the critical pressure ratio

It was also necessary to apply a correction to engine airflow, fan airflow, jet thrust, and net thrust because inlet setting pressure was not always the pressure corresponding to the desired Mach number.

The adjusted compressor inlet airflow was then obtained from

$$W_{a_{2_{adj}}} = \frac{W_{a_2}}{\delta_{2_{adj}}}$$

and fan inlet airflow was obtained from

$$W_{a_{22_{adj}}} = \frac{W_{a_{22}}}{\delta_{22_{adj}}}$$

where $\delta_{2_{adj}}$ and $\delta_{22_{adj}}$ are defined as the ratio of actual compressor and fan inlet total pressure, respectively, to the total pressure corresponding to the desired Mach number $\left(\frac{P_2}{P_{2_{des}}}\right)$ and $\left(\frac{P_{22}}{P_{22_{des}}}\right)$.

The adjusted jet thrust was then obtained from

$$F_{J_{s_{adj}}} = \left(\frac{F_{J_s}}{\delta_{2_{adj}}}\right) \left[\frac{\text{Desired } Kv_{8_{eff}}}{\text{Actual } Kv_{8_{eff}}}\right]$$

where desired $K_{V_{s_{eff}}}$ is based on the desired nozzle pressure ratio ($P_s/p_{0_{des}}$). Actual $K_{V_{s_{eff}}}$ is based on the actual nozzle pressure ratio (P_s/p_0). The adjusted net thrust is then obtained from the following:

$$F_{n_{s_{adj}}} = F_{j_{s_{adj}}} - \left[\frac{W_{a_{in}} - W_{leak}}{g\ \delta_{2_{adj}}}\right] V_\infty$$

where V_∞ is based on the desired Mach number.

FUEL-AIR RATIO

Engine fuel-air ratio was obtained from the expression:

$$f_e = \frac{W_{f_e}}{0.972\ W_{a_3}}$$

(Constant supplied by General Electric Company)

COMPONENT EFFICIENCIES

Compressor efficiency was obtained from the equation:

$$\eta_c = \frac{\left(\frac{P_3}{P_2}\right)^{\frac{\gamma_c - 1}{\gamma_c}} - 1}{\frac{T_3}{T_2} - 1}$$

where

$$\gamma_c = \frac{\gamma_2 + \gamma_3}{2}$$

REYNOLDS NUMBER INDEX

Reynolds number index was determined from

$$Re_I = \frac{\delta_2}{\phi \sqrt{\theta_2}}$$

where

$$\phi = \frac{718.2\ (\theta_2)^{1/2}}{T_2 + 199.5}$$

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13 ABSTRACT

A partial altitude military qualification test of the TF37-GE-1 turbofan engine was conducted in accordance with the procedures outlined in MIL-E-5009B dated January 1958. Steady-state and/or transient data were obtained at flight conditions in the altitude range from sea level to 36,000 ft and in the Mach number range from 0 to 1.0 with standard, hot, and cold atmospheres. The steady-state engine performance in terms of net thrust and specific fuel consumption was equal to or better than the rated performance. Windmill starts and simulated flameouts and relights at altitudes up to 26,000 ft were successfully accomplished. The qualification test was terminated prior to completion because of compressor damage caused by foreign object ingestion. (U)

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